



Long-Term Pavement Performance

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Federal Highway Administration, HRDI-13 Long Term Pavement Performance Team 6300 Georgetown Pike, Room F-209 McLean, Virginia 22101-2296

Attention: Jack H. Springer

Dear Mr Springer,

Reference: Construction Report for LTPP SPS-9A Project 370900,

Sanford, North Carolina, 1997/1998

Submitted herewith are two copies of the Construction Report on LTPP SPS-9A Project 370900, Highway US-1, Sanford, North Carolina This report was prepared by Basel Abukhater, NARO construction inspection representative present during the construction of the northbound new construction lanes, built in 1997, and Alex Rutka, NARO construction inspection representative present during the construction of the southbound overlay construction lanes, built in 1998

The northbound lanes involved building the three core sections, 370901, NC DOT standard mix with AC-20, 370902, Superpave mix with PG 64-22, and 370903, Superpave alternative mix with PG 70-22. The southbound lanes involved building six supplemental sections, 370960, Superpave mix with multigrade PG 76-22, 370961, Superpave mix with PG 64-22, 370962, Superpave mix with SBR Mod. PG 76-22, 370963, NC DOT standard mix with AC-20, 370964, Superpave mix with SBS Mod. PG 76-22, and 370965, Superpave mix with PG 70-22.

This report includes six appendices, Construction Highlights of Test Sections, General Correspondence, Sampling and Testing Plan Developed by NC DOT, Mix Design and JMF for Each Test Section, Project Deviation Report, and Photographs

Should you need additional information please call

Sincerely,

Frank Meyer

LTPP NARO Principal Investigator

cc G. Gibson and M Biswas, NC DOT

G Rada, LTPP-TSSC

L Rodriguez, FHWA-LTPP

B Abukhater and A Rutka LTPP NARO



U.S. Department of Transportation

Federal Highway Administration



North Carolina

LTPP Specific Pavement Studies

Construction Report on US-1 NB and SB, LTPP SPS-9A Project 370900 Sanford, NC, 1997/1998

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LTPP Specific Pavement Studies Construction Report on US-1 NB and SB, LTPP SPS-9A Project 370900, Sanford, North Carolina 1997/1998

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Prepared by

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This report provides a description of the construction of the SPS-9A experiment, SuperpaveTM asphalt binder study, field validation of the asphalt specifications and mix design, conducted as part of the Federal Highway Administration (FHWA) Long Term Pavement Performance (LTPP) program in Sanford, North Carolina The new construction of three asphalt concrete pavement test sections in the North Bound lanes started in April 1997 and was completed in July 1997 while the overlay construction of six asphalt concrete payement test sections in the South Bound started and was completed in September 1998 The construction started in the North Bound with subgrade preparation followed by paving with 89 mm base course. 76 mm binder course, and finally 64 mm of the surface course The South Bound was paved with 64 mm of the surface course laid in two equal lifts. The North Bound layers were paved using the NC standard mix with AC-20 for section 01. Superpave™ mix with PG 64-22 for section 02, and SuperpaveTM alternative mix with PG 70-22 for section 03 The South Bound surface layer was paved using the NC standard mix with AC-20 for section 63, SuperpaveTM mix with PG 64-22 for section 61. SuperpaveTM alternative mix with PG 70-22 for section 65, Superpave™ alternative mix with Multigrade PG 76-22 for section 60, Superpave™ alternative mix with SBR Modified PG 76-22 for section 62, and Superpave™ alternative mix with SBS Modified PG 76-22 for section 64 This report contains a description of the subgrade preparation, the paying operations, the equipment used by the contractor, the field sampling and testing operations before, during, and after construction, the laboratory gyratory compacted samples preparation and testing, problems encountered during construction, specific site circumstances, deviations from the standard guidelines, and a summary of the initial data collection

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N _{initial} , N _{design} , N _{max} , Volumetric	es. Monitoring, Survey, FWD		
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TABLE OF CONTENTS

LIST OF TABLES
LIST OF FIGURES
LIST OF PHOTOSV
I. INTRODUCTION
II. PROJECT DETAILS
Northbound New Construction Layout
Southbound Overlay Construction Layout
Field Materials Sampling and Testing Plan
Pre-Paving Field Sampling and Testing
Shoulder Probe
Cores
Bułk Subgrade and Subbase Samples
Density and Moisture Tests
5 Point Levels
III. CONSTRUCTION
Asphalt Plant and Materials
Mix Designs and Verifications
Pavement Preparation
Paving
Quality Control and Compaction
5 Point Levels
Post Construction Cores

Deviations	9
IV. SUMMARY	9
APPENDIX A	
Construction Highlights of Test Sections	· A-8
APPENDIX B	
General Correspondence B-1 - 1	B- 61
APPENDIX C	
Sampling and Testing Plans Developed by NC DOT, Dr. Biswas	C-23
APPENDIX D	
Mix Design and JMF	-65-2
APPENDIX E	
Project Deviation Report E-1 -	- E-5
APPENDIX F	
PhotographsF-1 -	F-14

LIST OF TABLES

(Tables followed with 'A' refer to Southbound Lane)

Table 1 Experimental Design for SPS-9A Experiments	11
Table 2A PG Asphalt Binders in SPS-9A Projects in the NA Region	12
Table 2B Binder Selection for SPS-9A Experiments in the NA Region	13
Table 3 Summary of SPS-9A Testing	14
Table 4 Site Layout, SPS-9A Project 370900 on North and South Bound Route 1	15
Table 5 Pavement Structure – New Construction	16
Table 5A Pavement Structure – Overlay Construction	16
Table 6 1 Agency Field Testing	17
Table 6 1A Agency Field Testing	18
Table 6.2 Agency Field Testing, Pre, During, and Post Construction	19
	21
Table 7 Agency Laboratory Testing Summary	24
Table 7A Agency Laboratory Testing Summary	24
Table 8 Agency Laboratory Tests on Mix Components	25
Table 8A Agency Laboratory Tests on Mix Components	26
Table 9 Level 1 Mix Design Testing for DOT and Alternative Superpave Mixes	27
Table 9A Level 1 Mix Design Testing for DOT and Alternative Superpave Mixes	28
Table 10 Quality Control Field Laboratory Testing of Paver Samples	29
Table 10A Quality Control Field Laboratory Testing of Paver Samples	30
Table 11 Superpave Level 3 Mix Testing, Agency Laboratory	31
Table 12 Superpave Level 3 Mix Testing, LTPP Contractor Laboratory	32
Table 13 Superpave Level 3 Mix Testing, Superpave Regional Test Center	33
Table 14 Bulk Material Samples to be Shipped to the LTPP MRL	34
Table 14A Bulk Material Samples to be Shipped to the LTPP MRL	35
Table 15 Agency Laboratory Tests on Cores Taken at Time A = 0	36
Table 15A Agency Laboratory Tests on Cores Taken at Time A = 0	37
Table 16 Agency Lab Cores at Time Intervals B to F = 6, 12, 18, 24, 48 Months	38
Table 16A Agency Lab Cores at Time Intervals B to F = 6, 12, 18, 24, 48 Months	39
Table 17 Agency Laboratory Tracking Table for Subgrade	40
	41
Table 18 Agency Laboratory Tracking Table for Combined Aggregate Samples	42
Table 18A Agency Laboratory Tracking Table for Combined Aggregate Samples	42
Table 19 Agency Laboratory Tracking Table for Asphalt Binder Samples	43
Table 19A Agency Laboratory Tracking Table for Asphalt Binder Samples	44
Table 20 Agency Lab Tracking Table for Other Than Superpave Lab Prepared Mixes	45
Table 20A Agency Lab Tracking Table - Other Than Superpave Lab Prepared Mixes	46
Table 21 Agency Lab Tracking Table for Superpave Laboratory Prepared Mixes	48
Table 22 1 Agency/Contractor (Field) Laboratory Tracking Table for Quality Control	
Than Superpave AC Mixes	50

Table 22 1A. Agency/Contractor (Field) Laboratory Tracking Table for Quality Contractor	rol - Other
Than Superpave AC Overlay Mixes	51
Table 22 2 Agency Laboratory Tracking Table for Superpave Mixes (Field Samples)	53
Table 23 Superpave Regional Test Center Tracking Table for Laboratory Prepared Spiritual Center Tracking Table 23 Superpave Regional Test Center Tracking Table for Laboratory Prepared Spiritual Center Tracking Table 23 Superpave Regional Test Center Tracking Table for Laboratory Prepared Spiritual Center Tracking Table Prepared Spiritual Center Table Prepa	pecimen
(To Be Sent to MRL)	55
Table 24 LTPP Contractor Laboratory Tracking Table for Gyratory Compacted Laboratory	ratory &
Field Superpave Mixes	58
Table 25 Agency Laboratory Tracking Table for AC Cores (Mixes Other Than Super	pave) – at
Interval A	60
Table 25A Agency Laboratory Tracking Table for AC Cores (Mixes Other Than Sup	erpave) –
at Interval A	61
Table 26 Agency Lab Tracking Table for AC Cores (Superpave) – at Interval A	63
Table 27 Agency Lab Tracking Table for AC Cores at Intervals B Through F	64
Table 27A Agency Lab Tracking Table for AC Cores at Intervals B Through F	65
Table 28 Summary of Gyratory Compaction Specimen IDs	66
Table 28A Summary of Gyratory Compaction Specimen IDs	67
Table 29 Bulk Material Samples for LTPP Materials Reference Library	68
Table 30 Sampling, Field Testing and Construction Dates	69
Table 31 Bulk Subgrade and Subbase (Lime Treated Subgrade) Samples	70
Table 32 Nuclear and Conventional Density and Moisture Tests - Subgrade and Subb	oase
	71
Table 33 Liquid Asphalt Suppliers	72
Table 34 Summary of NC DOT Standard Mix Designs 370901 and 370903 (Percent	Passing
Each Sieve Size)	73
Table 35 Summary of 37 5 Base and 19 0 Binder Course Superpave Mix Designs (Pe	ercent
Passing Each Sieve Size)	74
Table 36 Summary of 12 5 mm Superpave Surface Course Mix Designs (Percent Pas	sing Each
Sieve Size)	75
Table 37A Chronology of Mix Verification and Paving Operations	76
Table 38 Summary of Bituminous Paving Construction Data	77
Table 39 Bituminous Base, Binder and Surface Course Compaction Results - NBL	78
Table 39A Pavement Densities and Overlay Compaction Test Results - SBL	79
Table 40 Bituminous Base, Binder and Surface Course Thickness – 5 Point Levels	80
Table 41 Comparison of Surface and Binder Course Thickness	81
Table 42A Comparison of Surface Course Thickness	82
Table 43 Core Thickness Measurements July 29-30, $1997 - t = A (0 \text{ mos})$	83
Table 44 Core Thickness Measurements March 12, $1998 - t = B (6 \text{ mos })$	84
Table 45 Core Thickness Measurements July 16, $1998 - t = C (12 \text{ mos})$	85
Table 46A Core Thickness Measurements October 22, $1998 - t = A (0 \text{ mos })$	86
Table 47 Comparison of Core Thickness vs 5 Point Levels	87

LIST OF FIGURES

Figure 1 NC DOT SPS-9A Project 370900 Sanford NC	88
Figure 2A Layout of SPS-9A New Construction Sections US-1 NB, Sanford, NC	89
Figure 2B Layout of SPS-9A Overlay Test Sections US-1 SB, Sanford, NC	90
Figure 3 Materials Sampling and Testing Plan SPS-9A Section 370901	91
Figure 4 Materials Sampling and Testing Plan SPS-9A Section 370902	92
Figure 5 Materials Sampling and Testing Plan SPS-9A Section 370903	93
Figure 6 Materials Sampling and Testing Plan SPS-9A Section 370960	94
Figure 7 Materials Sampling and Testing Plan SPS-9A Section 370961	95
Figure 8 Materials Sampling and Testing Plan SPS-9A Section 370962	96
Figure 9 Materials Sampling and Testing Plan SPS-9A Section 370963	97
Figure 10 Materials Sampling and Testing Plan SPS-9A Section 370964	98
Figure 11 Materials Sampling and Testing Plan SPS-9A Section 370965	99
Figure 12 SPS-9A Project 370900 US-1 Sanford, NC Typical Sections	100

LIST OF PHOTOS

(APPENDIX F)

Photo 1 - North Bound - Shoulder probe with NC DOT drilling equipment	F-1
Photo 2 - North Bound - Backhoe for test pit to obtain subgrade samples and perform	n density
testing	F-1
Photo 3 - North Bound - Nuclear gauge density measurements at test pit location	F-2
Photo 4 - North Bound - Conventional balloon density measurements at test pit locat	ion
	.F-2
Photo 5 - North Bound – Laying binder course .	F-3
Photo 6 - North Bound – Laying surface course	F-3
Photo 7 - NC DOT inspector measuring truck mix temperature	F-4
Photo 8 - NC DOT inspector recording truck mix temperature	F-4
Photo 9 - Bulk sampling of asphalt concrete mix from a truck at the plant	F-5
Photo 10 - Bulk sampling of asphalt concrete base mix from the paver hopper on the	roadway
	F-5
Photo 11 - Bulk sampling of asphalt concrete binder mix from the paver hopper on the	e roadway
	F-6
Photo 12 - Bulk sampling of asphalt concrete surface mix from the paver hopper on t	he roadway
to the cooler box for temperature preservation for the gyratory compaction	F-6
Photo 13 - Placing the bulk samples of asphalt concrete surface mix from the paver h	opper on
the roadway to the cooler box for temperature preservation for the gyratory comp	action
	F-7
Photo 14 – Gyratory compaction of the hot mix bulk asphalt concrete samples	F-7
Photo 15 - Caterpillar Vibratory Compactor	F-8
Photo 16 - Hypac Vibratory Compactor	F-8
Photo 17 - Breakdown, intermediate and final rollers in action	F-9
Photo 18 - Measuring air temperature during paving	F-9
Photo 19 - Tack coat applied to first lift on the south bound lanes	F-10
Photo 20 - Steam from hot mix paving at section 370964 in the south bound	F-10
	F-11
Photo 22 – Obtaining hot mix samples at mid point of the test section	F-11
Photo 23 - NC DOT staff checking density with the nuclear gauge to establish rolling	g pattern
	F-12
Photo 24 - Textures of the coarse 12 5 mm superpave mix and the NC DOT standard	mix
	F-12
Photo 25 - SBR drums with dispensing devices to the pug mill, used for section 3709	962 in the
south bound lanes	F-13
Photo 26 - Obtaining an AC sample from the plant	F-13
Photo 27 - Lee Paving Asphalt Plant	F-14
Photo 28 - WIM with solar system and recorder at station 17+00, close to section 37	0965 in the
south bound lanes	F-14

Construction Report on US-1 NB and SB, LTPP SPS-9A Project 370900 Sanford, North Carolina 1997/1998

I. Introduction

This report describes the construction of the SPS-9A Project, SuperpaveTM (SUperior PERforming asphalt PAVEments) asphalt binder study, at Sanford NC SuperpaveTM is a mix design system which incorporates previous experience (Level I) and through use of material test results of both binders and mixes enables the designer to predict the performance of the pavement in terms of occurrence of rutting, fatigue cracking, and low temperature transverse cracking (Levels II and III) SuperpaveTM was developed by the Strategic Highway Research Program (SHRP) The SPS-9A experiment was developed by the Federal Highway Administration (FHWA) Long Term Pavement Performance (LTPP) Division in cooperation with federal, state, and provincial highway personnel The experiment design requires a minimum of 3 test sections to be constructed at each location of 32 projects in the experiment, as indicated by the unshaded cells in Table 1, representing specific combinations of average temperatures, temperature extremes, and moisture conditions. Construction can include new construction, reconstruction or overlay The minimum three test sections should consist of section 01, agency's standard mix, section 02, SuperpaveTM design mix, and section 03. Superpave[™] design mix with alternative binder with a grade either higher or lower than the required SuperpaveTM binder such that the performance characteristic of interest relative to the climate and pavement structure (either fatigue, low temperature or permanent deformation) may be expected to exhibit deterioration earlier in the service life of the pavement Since this is a material comparison study, the pavement structure and thickness Supplemental sections could be added to should be the same for all the test sections investigate additional experimental factors of specific agency interest

The objectives of the SPS-9A experiment are to observe the performance of SuperpaveTM mixes as well as comparable agency mixes, and to verify the asphalt binder selection procedure in SHRPBIND, which is a process for determining the environment (high and low temperatures) in which the pavement is constructed and will function. Table 2A lists the projects at five locations in the LTPP North Atlantic (NA) region where the SPS-9A experiment is being implemented, and where the SHRPBIND was used to display the PG asphalt grades from a particular weather station location showing the 50% and 98% reliability based on the temperature records at each site. Table 2B is another listing of these NA projects and the binder selection method used. The agencies' participation in this experiment depends on the availability of equipment to fulfill the performance and volumetric testing requirements as summarized in Table 3

The North Carolina Project 370900 is located on US1, near Sanford (Figure 1), from North of US 15-501 in Lee County to North of SR 1012 in Chatham County, a distance of 13 3 kms. The grading, drainage and paving consisted of the new construction of the northbound lane and the rehabilitation of the southbound lane which was being used as a two-lane road carrying traffic in both directions and

which was constructed in 1975 The property had been acquired for the northbound lane and some earth material had been placed during 1975

The FHWA-LTPP SPS-9A Project is located at the sound end of the NC DOT Contract and immediately south of Colin Road between Stations 17+00 - 101+00, Figures 2 and 3 The chainage runs from south to north

US-1 is a major arterial road with an Annual Average Daily Traffic (two directions) of 14,800 VPD with 11% heavy trucks and combinations of AADT. The estimated 1 8K ESAL rate in the study lane is 166,000 ESAL/yr. and the total Design 18K ESAL applications in the design lane are 3,320,000 ESAL for the design period of 20 years

The Project is located in the wet-no freeze environmental area. The annual rainfall is about 1200 mm which is quite evenly distributed throughout the year. The average 7 day Maximum Design Temperature is <64° C and the Minimum Pavement Design Temperature is >-16° C. Because nearly all of the asphalt binder in North Carolina falls in the PG 64-22 category and since the low temperature (LT) -22, covers LT-16, PG 64-22 was selected for the base line Superpave binder. North Carolina DOT selected rutting as the distress type for the alternative Superpave section 03 which would require a PG 58-22 binder. North Carolina DOT considered that the PG 58-22 binder was very close to AC-10 with which they have not had a good rutting performance experience and therefore, selected PG 70-22. Because the selection of the binder for the Alternative Superpave Design did not meet the criteria, FHWA approved the project but the project would not be eligible for incentive funds

The pavement structure of the new construction of the northbound lane is shown in Tables 4 and 5. It consists of 178 mm (203 mm shown on the plan) of lime treated subgrade, 89 mm of asphalt concrete base course. 76 mm of asphalt concrete binder course and 64 mm of asphalt concrete surface course. The same asphalt binder was used in all of the asphalt concrete layers in each of the test sections. The northbound lanes were constructed with 2-3 66 m lanes and a 1.22 m paved inside shoulder and a 4.57 m outside shoulder (3.05 m paved).

The existing southbound pavement. Tables 4 and 5A, consisted of 2-3 66 m lanes with 3 66 m inside and outside shoulders, both of which were paved to a 1 22 m width. The original pavement structure consisted of 203 mm of lime stabilized subgrade and 305 mm asphalt base, binder and surface courses. Through subsequent resurfacing, the asphalt concrete thickness prior to the overlay was 267-305 mm. The overlay construction involved widening the outside 1 22 m paved shoulder to accommodate a 3 05 m paved shoulder plus a 0 61 m earth shoulder. This required lowering the earth grade of the shoulder to receive 89 mm of black base prior to the overlay 1 83 m beyond the present paved shoulder. The overlay consisted of 64 mm of asphalt concrete, which was laid in 2-32 mm lifts. North Carolina intended the first lift to take out any irregulars prior to placing the second final lift.

The bids for this contract were opened on February 20, 1996. Lee Paving from Sanford, North Carolina was the successful Contractor. The Contractor's team consisted of Larry "Doc" Oldham, vice-president Operations, Tom Woodell, Superintendent, Ryan Thorton, Paving Crew Foreman, Ronald Bloxley, Foreman, J.J. Bonardi, QC Laboratory Supervisor in 1997, Mike Holdbrook, Laboratory Supervisor, 1998, Mike Burgess, Laboratory Technician, Mike Holmes, Plant Supervisor and Beth Chapin, Nuclear Density Technician in 1998.

The North Carolina DOT Construction Team consisted of Fred Sykes. Resident Engineer. John Olinger (1997) and Schliep (1998). Assistant Resident Engineers. Graham Johnson. Chief Inspector. Lee Phillips. Terry Wallace and M Yeager. Inspectors. Randal Wester. QA Nuclear Density Technician and Brad Comer. Division 8. QA Laboratory Supervisor—Brad also collected all of the QC HMAC Samples and delivered them to the QA Laboratory in Aberdeen

Dr "Moy" Biswas. North Carolina DOT Pavement and Research Engineer, assisted by Mustansir Kadibhai in 1997 and Dr Aiman S Kuzmar in 1998, coordinated and supervised the collection of samples between the Contractor and the North Carolina staff and provided technical assistance during the course of construction. Dr Biswas also provided the liaison between the North Carolina design staff, the LTPP Regional Coordinating Office Contractor (NARO) and FHWA in the preparation of this LTPP Project. Dr Biswas also arranged for NCAT to receive blended aggregate and asphalt binder samples and cores as well as blended aggregates and asphalt binder samples for Dr Kim at the North Carolina State University

The northbound lanes were constructed first and the asphalt concrete of the 3 main LTPP test sections were laid between May 14 and July 12, 1997. The overlay of the 6 test sections of the southbound lane were laid between September 9 and September 26, 1998. Appendix A

The WIM was installed in both the northbound and southbound lanes at Station 17+00 and will receive its energy from a solar panel

This was an end result specification contract. The Contractor was responsible for the asphalt mix designs and for providing QC during construction

A strategy planning meeting was held at the Division 8 Headquarters Office, Aberdeen, NC, on April 18, 1997 The meeting details and attendees are listed in the correspondence in Appendix B

II. Project Details

Northbound New Construction Layout

The northbound lanes contains the 3 main FHWA-LTPP test sections. Figure 2

- 1) 370901 the NC DOT Standard Mix with AC 20
- 2) 370902 the Superpave Mix with PG 64-22
- 3) 370903 a Superpave Alternative Mrx with PG 70-22

Southbound Overlay Construction Layout

The southbound lane contains 6 supplementary overlay test sections. Figure 2A

- 1) 370960 Superpave Design with Multigrade PG 76-22
- 2) 370961 Superpave Design with PG 64-22
- 3) 370962 Superpave Design with SBR Mod PG 76-22
- 4) 370963 North Carolina Standard Mix with AC-20
- 5) 370964 Superpave Design with SPS Mod PG 76-22
- 6) 370965 Superpave Design with PG 70-22

Test section 370961 was originally scheduled for a SMA mix with the Contractors choice of PG 76-22. A suitable SMA mix design could not be obtained, and it was replaced with the Superpave Design with PG 64-22.

Field Materials Sampling and Testing Plan

Dr Bill Phang, North Atlantic Regional Coordinating Office Contractor (RCOC) prepared the original Materials Sampling and Testing Plans which were revised from time to time. The final Field Materials and Testing Plans contain the Figures and Tables, which are included in this report. The

northbound lane covers Figures 2-5 and Tables 5-28. The southbound lane covers Figures 2A and 6-11, and Tables 5A to 28A The southbound lane has the same heading as the northbound lane except that the numbers are followed by the letter A to distinguish them from the northbound lane. Tables 11A, 12A, 13A, 21A, 22 2A, 23A, 24A and 26A are not included since they deal specifically with Superpave test section 02

The Materials Sampling and Field Testing were carried out in accordance with the Plans shown for each test section. The Plan also shows the laboratory tests that are to be performed along with the LTPP tests and the LTPP Protocols. Some of the Gyratory Compacted Specimens and cores of the Superpave test section 02 require testing at the Superpave Regional Test Center (SRTC) at Penn State University and the LTPP Contractor Laboratory (Braun). The samples scheduled for SRTC will be sent to the Materials Reference Library (MRL) for storage until the SRTC test procedures are finalized. The cores for SRTC will not be taken until further notice.

Dr Biswas, in his well organized way, prepared an internal Sampling and Testing Plan outlining the sampling and testing responsibilities for both the northbound and southbound lanes, Appendix C It should be noted that combined aggregate and asphalt binder samples were obtained for NCAT and for Dr Kim at the North Carolina State University (NCSU) Interval A cores were also obtained for NCAT from test sections 02 and 03 The testing that will be carried out by these 2 organizations is not included in the Report

The samples for MRL for permanent storage are shown in Table 29

Pre-Paving Field Sampling and Testing

The Pre-Paving activities for the northbound and southbound lanes are shown in Table 30

Shoulder Probe

The shoulder probes of the northbound lane were taken on May 12. 1997 by NC DOT with the assistance of Basel Abukhater (LTPP-NARO) at the midpoint of test sections 01 and 02 (2+50) and at 0+00 (33+50) for test section 03. Figures 3. 4 and 5 Bedrock was not encountered in shoulder probes in sections 02 and 03 within 6.1 m, but soft weathered rock (Triassic Basin) was encountered from 3.5-6.1 m in test section 01. The predominate soil is a silty clay

The southbound lane shoulder probes were taken by Dilan Singaraja (LTPP-NARO), on August 13, 1998 at the midpoint of each test section (2+50), Figures 6-11. All of the probes reached 6.1 m except for test section 6.1 where the shale bedrock was encountered at 1.5 m (80+00), and test section 6.2 where bedrock was encountered at 0.8 (66+00).

Cores

Two 305 mm cores were taken at each test section at 0-25 and 5+25 as shown on the plans on August 12, 1998. After measuring the thickness of each of the 12 cores, 6 cores (1 from each section) were selected for the Visual Determination of AC Moisture Related Damage in order to complete Sample Data Sheet 3. All of the cores were then discarded

Bulk Subgrade and Subbase Samples

Bulk subgrade and lime stabilized subgrade (subbase) samples were taken at 0-50 at test sections 01 and 02, and 0-300 at test section 03 of the northbound lane by Randy Plett (LTPP-NARO) on May 6-7. 1997. Table 31 Test pits were made to obtain the samples and to obtain the density and moisture content of both the subgrade and subbase. The test pits were then backfilled

Bulk subgrade and moisture samples of the southbound lane were obtained with auger borings by Dilan Singaraja on August 12, 1998, at 0-25 and 5+25 for each test section shown in the Materials Sampling and Testing Plan and in Table 31

Density and Moisture Tests

Density tests were taken of the subgrade and subbase of the northbound test sections at the test pit locations from which the subgrade and subbase samples were obtained on May 6-7, 1997 Additional density and moisture tests were made of the subbase on May 13, 1997, Table 32

Both nuclear and conventional equipment were used to determine the density and moisture content. The % compaction was obtained from the conventional (balloon) equipment

5 Point Levels

Five Point Levels were taken of the subbase on the northbound lane on April 21, 1997 and of the top of the existing pavement of the southbound lane prior to the overlay on August 12, 1998

III. Construction

Asphalt Plant and Materials

The Lee Paving Asphalt Plan located on Rocky Fort Church Road. 1 6 kms east of US 1 and 17 6 kms from the south end of the test sections was used for all of the test sections in the northbound and southbound lanes except for the base and binder courses of test section 01 which used the Moncure Asphalt Pant. The Sanford Plant is a 8000 lb. Batch Plant manufactured by ASTEC. It has 5 aggregate bins, I silo and I liquid asphalt storage tank.

At the Sanford Plant, the liquid asphalt is heated with coils located near the bottom of the storage tank. There is no agitator. The storage tank is emptied when a different grade of liquid asphalt is required.

There was no particular problem with heating the asphalt binder for the mixes in the northbound lane. In the southbound lane 2, tank trucks of liquid asphalt were required for each test section which were 427 m in length compared to 853 m for the northbound test sections. When the storage tank was emptied, the liquid asphalt level fell below the level of the coils. It took one tank truck load to reach the level of the coils. The liquid asphalt usually arrived at the plant at a temperature below 121° C, and it took 6 hours or more to reach 149° C before a trial batch could be made for mix verification purposes. The silo at the Sanford Plant was only used for the North Carolina DOT Standard Mix HDS section 63

The liquid asphalt was obtained from several suppliers. Table 33

For the Moncure Plant, the coarse aggregate and screenings were obtained from the Wake-Stone-Moncure Quarry and for the Sanford Plant from Martin Marietta Quarry at Lemon Springs located 3 2 kms from the Plant The natural sand for both Plants was obtained from the Lee Paving Rambeaut Pit

Mix Designs and Verifications

The Superpave Mix Designs were prepared by Sam Johnson of Martin Marietta. The North Carolina DOT Standard Mixes were prepared by John Bonardi of Lee Paving. All of the mix designs were approved by Carson Clippard. North Carolina Materials and Testing Laboratory. The JMF was

approved by J E Grady, North Carolina Pavement Construction Engineer All of the mix designs and JMF for this project are shown in the following Tables

- ◆ Table 34 Summary of NC DOT Standard Mix Designs
- ◆ Table 35 Summary of 37 5 mm Base and 19 0 mm Binder Superpave Mix designs
- ◆ Table 36 Summary of 12 5 mm Superpave Surface Course Mix Designs

The Mix Designs and JMF are also shown in Appendix D

The Contractor was required to verify that the Plant could produce the mixes to the requirements of the JMF and to the volumetric parameters of the Superpave Mix Designs This verification was made for each of the Superpave mixes The North Carolina DOT Standard Mixes were not verified during construction of the test sections because they had been previously verified

The Plant verification involved producing a trial batch of HMAC from which samples for testing were obtained. These tests were carried out at the Contractors Laboratory located at the Plant. It took at least 3 hours to check a sample. If the sample did not meet the specification requirements, adjustments to the mix were made and another batch was produced for sampling and testing. Brad Comer, Division 8 QA Laboratory Supervisor, was at the Contractors Plant observing the testing procedures and reviewing the final test results. With his acceptance of the test results, production for paving could begin. The chronology of the verifications and the paving operations of the southbound lane is shown in Table 37A.

Trial sections are required to evaluate the paving and compaction equipment. For trial section 02, the base course was placed on May 6, the binders course on May 7, and the surface course on May 8, 1997. All of the equipment and compaction results were satisfactory.

Paving of trial section 03 started on June 30, 1997, but it was stopped when it was discovered that the mix had too low a void content. Paving started up again on July 1 with an adjusted mix but it was stopped because of rain and because of the low void content at 30+50. Further tests were carried out on July 2 and the results still showed a low void content. The North Carolina DOT gyratory compactor had been struck by lightening so cores were taken to determine the actual void content. The voids were found to be satisfactory and the Contractor could proceed with the mix but the joint was in the monitoring section which was considered unacceptable. The monitoring section was shifted from 30+50 - 35+50 to 33+50 - 38+50.

Trial sections were not laid for the southbound test sections. After the mix had been approved through the verification process and before production of HMAC started, heated blended aggregate was processed through the pug mill and dumped into a front end loader which was then dumped into a small stockpile from which samples were obtained. The blended aggregate samples were taken in accordance with Tables 6.2 and 6.2A for North Carolina DOT, NCAT and NCSU. The asphalt binder samples were taken from the storage tank about 1 hour after the production of the mix started.

Pavement Preparation

In the northbound lane, the asphaltic concrete base course was placed directly on the tack coat curing membrane of the subbase. In the southbound lane, the existing pavement was broomed and then received CRS-1 tack coat at the rate of 0 03 gals/sq yd. In all of the test sections, the tack coat was also applied between lifts if traffic has been using the lane or if the lane had been exposed overnight without traffic. A tack coat was not applied if the second lift immediately followed the first lift as was the case in section 60.

Paving

The Blaw Knox PF510 paver was used on the northbound lane and the Blaw Knox PF3200 on the southbound lane.

Two double drum vibratory rollers plus one static roller were available at all times although only two were required and used on some test sections. The vibratory rollers were a 12-ton Caterpillar CB34B and a 10-ton Hypac C776B. The two rollers exchanged breakdowns and intermediate rolling positions. When the Hypac roller broke down, it was replaced with another Caterpillar CB34B. The static rollers were on the northbound lane and a 10-ton Ferguson on the southbound lane.

All of the test sections were staked It was easy to tie the paving activities to the chainage in both the northbound and southbound lanes In the northbound lane, the asphalt layers were paved from north to south except for the base course of sections 02 and 03 which were paved from south to north. All of the layers in the southbound lanes were paved from north to south

Dr Biswas requested that the inside lane of each layer be placed first so that if any problems arose, they could be corrected before laying the driving lane. He also anticipated that more samples of the southbound driving lane might be required in the future and he wanted most of the transition areas covered with the same mix as the monitoring section. He therefore marked out the ends with a tolerance of +/-10 67 m. When the estimated quantities of mix fell short of the mark, a wait of 30 minutes or more was often required before a truck could be obtained and redirected to complete the layer.

All of the layers of the northbound and southbound passing lanes were paved to a width of 4 87 m (3 66 m + 1 22 m inside shoulder) The northbound driving lane consisted of a 3 66 pavement and a 4 57 m shoulder (3 05 m paved shoulder) All of the hot mix layers were placed to a width of 4 27 m (3 66 m + 0 61 m outside shoulder) 76 mm of granular base was then placed followed by 89 mm of asphalt concrete base and finally 2 44 m of 64 mm of North Carolina DOT Standard Surface Course Mix HDS The remainder of the 1 52 m shoulder consisted of earth materials

The southbound driving lane consisted of 3 66 m of pavement and a 3 66 m shoulder (1 22 m paved) The subgrade beyond the 1 22 m shoulder was lowered to receive 89 mm of asphalt concrete to a width of 1 83 m to meet the level of the existing shoulder prior to the placement of 4 27 m of surface course 64 mm of North Carolina DOT Standard Surface Course Mix HDS was placed to a width of 2 44 m. The remaining 0 61 m of shoulder consisted of earth materials. A typical pavement section is shown in Figure 12.

The haul distance from the plant to the road was less than 19 2 kms and the haul time was less than 30 minutes. The construction data obtained included hot mix temperature at the paver, laydown temperature, time to pave the monitoring section, nominal thickness, air temperature and any other data that may have an influence on the performance of the pavement. The mixing temperatures were not taken at regular intervals, but the intended mix temperatures were known. In the northbound lanes, the air temperatures were taken with a Pacer DH200 Digital Hygro Thermometer to an accuracy of 0 l degrees. In the southbound lane, the air and laydown temperatures were taken with an Infrared Thermometer.

The laying of the HMAC in all of the test sections went smoothly. Paver stops were made to allow for the HMAC temperatures to be taken of each truck, to allow samples to be taken from the paver hopper at the mid-point of each monitoring section, to level out any paver overspills and to wait for trucks particularly near the ends of test sections when the tonnage of HMAC was underestimated. All of the bulk HMAC samples were taken at 2+50 of each layer of every test section by Brad Comer. They were placed in boxes, bags and an insulated container (cooler) and taken to the QA Laboratory in Aberdeen. One bag was sent to the North Carolina DOT Raleigh Laboratory for extraction.

gradation and specific gravity tests The number of samples taken for each test section are shown in Appendices A and C

The average time to lay the surface course in the monitoring sections of the northbound lane was 41 minutes (64 mm thickness) and in the southbound lane, it was 24 minutes for the first lift and 20 minutes for the second lift. A summary of the Bituminous Paving Construction Data is shown in Table 38

Table 30 shows the paving dates of each layer of each test section. In the northbound lane, the curing time can be measured in days, whereas in the southbound lane, the curing time can generally be measured in hours which are as follows

Section 60, 2 hours, section 61, 7 hours. section 62, 16 hours, section 63, 2 5 days, section 64, 22 hours, and section 65, 5 hours

The tapered joint at the end of each lift consisted of placing a 1 52 m wide strip of joint paper (comes in 0 61 m widths) then covering it with HMAC. The joint can be removed and prepared quickly with a scraper and a broom attached to the tractor. In difficult mixtures, the tapered joint had to be removed with a power grader.

Quality Control and Compaction

The target densities for the asphalt mixes for the northbound lane were obtained from the control strips. It was not practical to construct these control strips ahead of time for the Superpave test sections on the southbound lane. The control strips require the placement of 80 tons of hot mix before a 91 m control strip can be selected to obtain 5 randomly selected locations to obtain 5 densities and cores to obtain an average density

Because cores could not be taken in the driving lane, all the control strips of the southbound lane were selected in the passing lane. The test results of the densities verified by cores were not available during the paving of the test section. Instead, 92% of the maximum specific gravity of the asphalt plan mix was the target for compaction control purposes. Randal Wester took all of the nuclear density measurements for Construction Data Sheet 14 taken at 3 locations of each monitoring section as shown on the Materials Sampling and Testing Plans. The test results are shown in Table 39 and Table 39A.

5 Point Levels

The 5 Point Levels were taken of each layer of the northbound lane above the subbase and only of the surface course above the existing pavement in the southbound lane. The thickness of these layers is shown in Table 40.

Table 41 shows a comparison of the thickness of each section of the northbound lane with the average thickness of other test sections. Table 42A shows a comparison of the thickness of the surface course with the average comparison of other test sections in the southbound lane.

Post Construction Cores

Cores were taken at the locations shown on the Materials Sampling and Testing Plans North Carolina DOT supplied the drilling equipment and the operator. The model B3300 Foremost drill was mounted on a truck capable of carrying out auger work. The cores for Interval A that were to be shipped to other Laboratories were taken to the Aberdeen Laboratory. All other cores were taken to the Raleigh Materials & Testing Laboratory.

The dates at which the cores were taken and the Core Thickness Measurement Tables are as follows

Northbound Lane

Interval A (0 months) - July 29-30, 1997, Table 43 Interval B (6 months) - March 12, 1998, Table 44 Interval C (12 months) - July 16, 1998, Table 45

Southbound Lane

Interval A (0 months) - October 22, 1998, Table 46A

It should be noted that the Guidelines show that the thickness of the surface layer (binder and surface) should not vary more than 10mm from design. In all cases, the borngs showed that the thicknesses fall within this requirement for the northbound lane. Only the total thickness of the core was measured in the field for all of the southbound test sections shown on Table 46A.

A comparison of the core thickness measurements from outside the monitoring section with measurements of the 5 point levels within the monitoring sections of the northbound lane are very close, Table 47

Deviations

The deviations, as outlined in Appendix E, are only applicable to the 3 test locations in the northbound lane. Construction of these test sections was completed on July 12, 1997. All of the required material samples for QC tests were obtained but the test results are not available at this time. The deviations are as follows

North Carolina DOT selected the PG 70-22 Asphalt Binder in the Superpave Alternate Mix Design for sections 03 instead of PG 58-22 as indicated in the Guidelines

Bulk HMAC Mix Samples for Quality Control were taken at the mid-point of each test section instead of 2 samples spaced at equal intervals within the test section

North Carolina DOT specifications stipulate a minimum compaction of 92% of the maximum specific gravity density of the Bituminous mixture. The compaction tests for the base and binder courses of section 02 were below this level as well as the base and surface courses for section 03. Table 39

For this project, the superpave gyratory compaction effort at a design ESALs of 3-10 million and an average design high air temperature of less than 39° C should have been $N_{im}=8$, $N_{des}=96$, and $N_{max}=152$ NC mistakenly used $N_{im}=8$, $N_{des}=106$, and $N_{max}=169$ which are used at the same range of design ESALs but for an average design high air temperature of $39-40^{\circ}$ C

A Profile Index of the pavement surface was not obtained because North Carolina DOT does not have a specification for a profile index requirement nor a California type Profilograph

No friction data is available for this project

IV. Summary

This FHWA-LTPP SPS-9A Project is part of North Carolina Project 6 54900IT (R2500A) which is located on US-1 from north of US 15-501 in Lee County to north of SR 1012 in Chatham County, a distance of 13 3 kms. The SPS-9A Project is located at the southern 2 6 kms of the North Carolina Project. The bids for the Contract opened on February 20, 1996. Lee Paving Ltd. from Sanford, North Carolina was the successful bidder.

US-1 is a major two lane arterial road carrying 2-way traffic. The Contract involved the new construction of 2 northbound lanes and a 64 mm overlay of the existing 2 southbound lanes resulting in a 4 lane divided highway with a 18 9 m median strip

The new construction included 3 main test sections, a Superpave Mix, a Superpave Alternate Mix and a North Carolina Standard Mix. The pavement structure consisted of 178 mm of lime stabilized subgrade, 89 mm of AC base, 76 mm of binder and 64 mm of surface courses. All of the AC layers contained the same binder for each of the test sections. It was constructed to 1 22 m inside and 3 05 m outside paved shoulders

The southbound lanes contained 6 supplementary test sections, 5 test sections with the Superpave design and 1 with the North Carolina Standard Mix design. The 64 mm surface course overlay was placed in 2-32 mm lifts. Prior to the overlay, the southbound lane had 2-3 66 m shoulders with a 1 22 m paved inside and outside shoulder. With the overlay, the 1 22 m inside pavement shoulder was retained and the outside paved shoulder was widened to 3 05 m.

The paving of the northbound lane took place from May 14 to July 12, 1997 and the southbound, from September 12 to September 26, 1998 The Field Sampling and Testing was carried out according to the Materials Sampling and Testing Plans Additional binder and blended aggregate samples were obtained for NCAT and NCSU as well as additional Interval T-0 cores for NCAT

The Contract required plant mix verification of each mix prior to production and the construction of control strips to determine the adequacy of the laydown equipment and to determine a target compaction density. The only problem with the mix on the northbound lane was the suspected low voids with AC base course of sections 3 approaching the monitoring section. Due to the breakdown of the QA Aberdeen Laboratory gyratory compactor, cores were used to check the air voids which turned out to be satisfactory. The sections 03 monitoring section was shifted to eliminate a joint in the sampling area.

In the southbound lanes, the major problem with the mix verification was the low void content. The asphalt binder usually arrived later and colder than expected. The binder had to be heated for up to 6 hours before a HMAC batch could be prepared for verification purposes. Each mix verification took 3 hours. In most cases, more than one verification were required due to low voids.

The control strips in the northbound lane did not create any difficulty. It was not practical to lay control strips ahead of time in the southbound lane to arrive at target densities. Instead, the control strips were established within the passing lane of each test section but the core results were not available until after the test section was completed. For QC purposes, densities obtained were compared to a maximum specific gravity of the mixture to arrive at % compaction.

The paving operations for all of the test sections went very smoothly with very little delays. Any delays can be attributed to holding up trucks to obtain the mix temperatures, taking HMAC bulk samples, leveling overspills, waiting for the last truck, changing paving lanes and preparing the joint. The asphalt plant also broke down for several hours on 2 occasions and once the burner flamed out during the night requiring several hours to bring the asphalt binder up to the mixing temperature.

The working relationship between North Carolina DOT and Lee Paving was excellent. Dr Biswas provided the technical advice as required and his wisdom and advice was sought and respected. Dr Biswas was a good communicator and kept everyone involved about the status of the project through personal contact and/or e-mail

Special recognition must be give to Mike Holdbrook. QA Laboratory Supervisor for Lee Paving, and Brad Comer. North Carolina Division 8. QA Laboratory Supervisor at Aberdeen Brad stayed with the verification process until an acceptable mix was obtained. He approved the JMF on the spot as soon as the requirements were made so the hot mix production could commence. Brad also took all of the HMAC samples in boxes, bags and coolers to the Aberdeen Laboratory with 1 bag going to the Raleigh Laboratory. The work by Mike and Brad was very much appreciated.

Basel Abukhater represented Stantec Consulting during the construction of the test sections in 1997 and Alex Rutka in 1998

Table 1 Experimental Design for SPS-9A Experiments

Moisture	Moisture			mm/year	of	Dı		mm/year	of
Average 7 Maximum Pay Design Tempe	ement	<52C	<58C	<64C	<70C	<52C	<58C	<64C	<70C
	>-46C								
!	>-40C		-						
Minimum	>-34C								
Pavement Design Temperature	>-28C						,,,		
	>-22C								
	>-16C		•	<i></i>			Sangangagagasan as		
	>-10C								

Notes Traffic rate should exceed 50,000 ESAL/year in study lane Total traffic for design (design life) is Agency choice

The average 7-day maximum pavement design temperature is the average of the highest daily pavement temperatures for the seven hottest consecutive days. The minimum pavement design temperature is the coldest pavement temperature of the year.

Table 2A PG Asphalt Binders in SPS-9A Projects in the NA Region

Moisture			et > 635 m	m/year of	fprecipitation	on
Average 7 Day Maximum Pavement Design Temperature			•••••••••••••••••••••••••••••••••••••••			
*** *** ****		<52C	<58C	<64C	<70C	<76C
	>-46C	98%QE	98%ON			
	er and all dead of an are	02-QE	02-ON			
	>-40C	50%QE 50%ON	,			
	> - 34C	03-QE	03-ON			7 7
Minimum Pavement Design Temperature	>-28C	03-NJ	02-NJ 98%NJ 98%CT	02-CT		61-NJ
·	>-22C	50%CT	50%NJ	02-NC 03-CT 98%NC	03-NC	60-NC
	>-16C		50%NC			
	>-10C	,				

Notes Traffic rate should exceed 50,000 ESAL/year in study lane

Total traffic for design (design life) is Agency choice

The average 7-day maximum pavement design temperature is the average of the highest daily pavement temperatures for the seven hottest consecutive days. The minimum pavement design temperature is the coldest pavement temperature of the year.

02-NC Used in Superpave[™] section 02

03-NC Used in Alternative Superpave™ section 03

98%NC SHRPBIND PG Asphalt 98% Reliability

50%NC SHRPBIND PG Asphalt 50% Reliability

Table 2B Binder Selection for SPS-9A Experiments in the NA Region

Agency / SPS-9A ID	Weather Station Location	Lat. N / Long. W	SHRPBIND PG Asphalt 98% Reliab. / 50% Reliab.	PG Binder in Superpave TM Section 02	Binder in Agency Section 01	PG Binder in Alternative Superpave ^{IM} Section 03	Other Binders in Experiment
Connec-	Colchester	41 55 /	58-28 /	PG 64-28	AC 20	PG 64-22	Same 3 with
ticut /		72 37	52-22				RAP
090900							
New	Highstown	40 27 /	58-28 /	PG 58-28	AC 20	PG 52-28	PG 64-22
Jersey /		74 57	58-22				PG 76-28P
340900							AC 20 RAP
North	Moncure	35 58 /	64-22 /	PG 64-22	AC 20	PG 70-22	PG 76-22MC
Carolina		79 05	58-16				PG 76-
1			; 				22SMA
370900						•	PG 76-
							22SBR
							AC 20
							PG 76-
							22SBS
							PG 70-22
Ontario /	Petawawa	45 95 /	58-46 /	PG 58-40	85/100	PG 58-34	PG 58-28
870900		77 32	52-40		Pen Gr		PG 58-34P
					İ		PG 58-40M
Quebec /	Shipshaw	48 45 /	52-46 /	PG 52-40	PG 52-34	PG 52-34	
890900	-	71 22	52-40				
89A900		,					}

Notes P Polymer Modified

M Marshal Design

RAP Recycled Asphalt Pavement

MG Superpave design with Multigrade PG 76-22

SMA SMA Mix with contractor choice of PG 76-22

SBR Superpave design with SBR modified PG 76-22

SBS Superpave design with SBS modified PG 76-22

Table 3 Summary of SPS-9A Testing

Project	Test	Time After Construction, months						
Туре	Section	0	6	12	18	24	48	
Main Study	Agency	V	V	V	V	V	v	
	LTPP Binder	S*	v	V	V	V	V	
	Alternate LTPP Binder	V	V	V	V	V	V	
Superpave™ Level III Sites	Agency	S		S		S	S	
	LTPP Binder	S*		S		S	S	
	Alternate LTPP Binder	S		S		S	S	

Notes

Testing Types

V = volumetric and binder stiffness tests

 $S = Superpave^{TM}$ Level III performance tests

S* - SuperpaveTM Level III testing at t=0 months will be performed on 3 sets of specimens, design mixture in the laboratory, plant mixture compacted in the laboratory, plant mixture compacted in the field (cores)

Table 4 Site Layout, SPS-9A Project 370900 on North and South Bound Route 1

Constr- uction Stations	Experiment Stations	Length (m)	New ConstructionA C Thickness mm	Old ConstructionA C and Base/SubbaseT hickness mm	Remarks	Section ID
North Bound	New Construction					
33+50	0+00	1	64 Surtace	178 Subbase	2 12' lanes	
_		152 4	76 Bınder	(Lime Stabilized	4' paved inside should	370903
38+50	5+00		89 Base	Subgrade)	15' outside shoulder (10'	
					paved)	
53+00	0+00		64 Surface	178 Subbase	2 12' lanes	
	<u> -</u>	152 4	76 Binder	(Lime Stabilized	4' paved inside should	370901
58+00	5+00		89 Base	Subgrade)	15' outside shoulder (10'	
		ļ			paved)	
91+50	0+00		64 Surface	178 Subbase	2 12' lanes	
-	-	152 4	76 Binder	(Lime Stabilized	4 paved inside should	370902
96+50	5+00		89 Base	Subgrade)	15' outside shoulder (10'	
					paved)	
South Bound	Overlay Construc	tion				
	1			25 Surface	2 12' lanes	
96+50	0+00		64 Surface (laid	25 Surface	12'inside and outside	
-	-	152 4	ın 2 equal lıfts)	51 Surface	shoulder (4 paved)	370960
91+50 5+00	5+00			51 Binder	Widen to	
			203 AC Base	12' outside shoulder (10		
				203 Subbase	paved)	
	1			25 Surface	2 12' lanes	
82+50	0+00		64 Surface (laid	25 Surface	12'inside and outside	
-	-	152 4	in 2 equal lifts)	51 Surtace	shoulder (4 paved)	370961
77+50	5+00			51 Binder	Widen to	
				203 AC Base	12' outside shoulder (10	
				203 Subbase	paved)	
				25 Surface	2 12' lanes	
68+50	0+00	1	64 Surface (laid	25 Surface	12'inside and outside	270063
-	-	152 4	in 2 equal lifts)	51 Surface	Shoulder (4 paved) Widen to	370962
63+50	5+00	ļ		51 Binder		ļ
	 		1	203 AC Base	12' outside shoulder (10	1
		 		203 Subbase	paved) 2 12 lanes	
	, , , ,	1	(14)	25 Surface	12 lanes	
54+50	0+00	152.	64 Surface (laid	25 Surtace 51 Surtace	shoulder (4 paved)	370963
10.50		152 4	in 2 equal lifts)	51 Surface 51 Binder	Widen to	3,0703
49+50	5 ⊧00	1		203 AC Base	12 outside shoulder (10	
		1		203 AC Base 203 Subbase	paved)	
		-		25 Surface	2 12 lanes	
40+50	0+00	1	64 Surface (laid	25 Surface	12 inside and outside	
40+30	J 0, 100	152 4	in 2 equal lifts)	51 Surface	shoulder (4 paved)	370964
- 35+50	5+00	1324	in 2 equal in s)	51 Binder	Widen to	
15-50	1 3.00			203 AC Base	12 outside shoulder (10	1
	1			203 Subbase	paved)	ļ
	 	 		25 Surface	2 12 lanes	
26+50	0+00		64 Surface (laid	25 Surface	12 inside and outside	
20.50		152 4	in 2 equal lifts)	51 Surface	shoulder (4 paved)	370965
21-50	5 · 00	1		51 Binder	Widen to	
2. 00				203 AC Base	12 outside shoulder (10	
				203 Subbase	paved)	

Surface - AC Dense Graded Asphalt Concrete Surface Laver
Binder - AC Dense Graded Asphalt Concrete Binder Laver
AC Base - AC Dense Graded Asphalt Treated Premixed Base Laver

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TABLE 5
SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC
Pavement Structure - New Construction

Layer No.	Project Layer Code	Layer Thickness Ins. (mm)	Material Code	Material Description/Comments	Depth to Rock Ft.
I	A	N/A	148	Subgrade Soils - Clay/Loam	
			146-2 5 5 5 5 to		
2	С	7 (178)	181	Lime Stabilized Subgrade	
3	D	3-1/2 (89)	322	Asphalt Concrete Base Course, Type HB	
4671.472.100			155 55 EV		Section 1
4	Е	3 (76)	01	Asphalt Concrete Binder Course, Type HDB	
5	F	2-1/2 (64)	01	Asphalt Concrete Surface Course, Type HDS	

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TABLE 5A
SPS-9A PROJECT 370900, HIGHWAY US-1 SOUTHBOUND, SANFORD, NC
Pavement Structure - Overlay Construction

Layer	Project	Layer	Material	Material Description/Comments	Depth
No.	Layer	Thickness Code			to Rock
	Code	Ins. (mm)			Ft.
1	А	N/A	148	Subgrade Soils - Clay/Loam	
2	С	8 (203)	181	Lime Stabilized - Subgrade	
	4				
3	D	8 (203)	322	Existing Asphalt Concrete Base Course	
4	Е	2 (51)	01	Existing Asphalt Concrete Binder Course	
		100			
5	F	2 (51)	01	Existing Asphalt Concrete Surface Course	
6	F	1 (25)	01	Existing Asphalt Concrete Surface Course	
7	Г	1 (25)	01	Existing Asphalt Concrete Surface Course	
8	F	2-1/2 (64)	01	Asphalt Concrete Surface Course	

FHWA-LTPP-NARO Revised 6/20/97

TABLE 6.1
SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC
Agency Field Testing

	Agency Field Testing						
Field Tests	Test	No. of	Test Location (Identifier)				
		Tests					
Subgrade							
Depth to Rigid Layer	shoulder auger probe to 6m or refusal	1 per section	Sta 2+50 at edge of shoulder (S01AXX)				
Nuclear Density Tests	AASHTO T238-86	1 per	Sta (0-50), 5' from				
prepared Subgrade	backscatter	section	pavement edge (T01AXX)				
Lıme Stabilızed Subgrade							
Nuclear Density Tests	AASHTO T238-86	3 per	Sta 1+00, 2+50, and 4+00, 5' from				
Finished Surface	backscatter	section	pavement edge (T02AXX-T04AXX)				
Establish TBM's and	rod and level	55 per	5 transverse locations (pavement edges,				
Baseline Levels		section	mid-lane, wheel tracks) at 50' intervals				
AC Base							
Nuclear Density Tests	AASHTO T238-86	3 per	Sta 1+00, 2+50, and 4+00, 5' from				
Finished Surface	backscatter	section	pavement edge (T05AXX-T07AXX)				
Finished Surface Levels	rod and level	55 per section	Above points located in baseline survey				
AC Binder							
Nuclear Density Tests	AASHTO T238-86	3 per	Sta 1+00, 2+50, and 4+00, 5' from				
Finished Surface	backscatter	section	pavement edge (T08AXX-T10AXX)				
Finished Surface Levels	rod and level	55 per section	Above points located in baseline survey				
Post-Construction							
Nuclear Density Tests	AASHTO T238-86	3 per	Sta 1+00, 2+50, and 4+00, 5' from				
Finished Surfaces	backscatter	section	pavement edge (T11AXX-T13AXX)				
Finished Surface Levels	rod and level	55 per section	Above points located in baseline survey				

Note: XX Last two digits of location identifiers is the section number (01, 02, 03) Stationing is in feet

FHWA-LTPP-NARO Revised 2/18/97

TABLE 6.1 A
SPS-9A PROJECT 370900, HIGHWAY US-1 SOUTHBOUND, SANFORD, NC
Agency Field Testing

Field Tests	Test	No. of Tests	Test Location (Identifier)
Pre-Construction			
Depth to Rigid Layer	shoulder auger probe to 6m or refusal	1 per section	Sta 2+50 at edge of shoulder (S01AXX)
Field Examination of Cores for Stripping	LTPP	1 per section	Sta 0-25, 3' offset - 12" (305mm) cores for access to underlying layers (CA01AXX)
Nuclear Density Tests Existing Pavement Surface	AASHTO T238-86 backscatter	3 per section	Sta 1+00, 2+50, and 4+00, 3' from pavement edge (T01AXX-T03AXX)
Establish TBM's and Baseline Levels	rod and level	55 per section	5 transverse locations (pavement edges, mid-lane, wheel tracks) at 50' intervals
Post-Construction			
Nuclear Density Tests Finished Surfaces	AASHTO T238-86 backscatter	3 per section	Sta 1+00, 2+50, and 4+00, 3' from pavement edge (T04AXX-T06AXX)
Finished Surface Levels and on Top of Intermediate Layers where Desired	rod and level	55 per section	Above points located in baseline survey

Note: XX Last two digits of location identifier is the section number (60, 61, 62, 63, 64, 65) Stationing is in feet

FHWA-LTPP-NARO Revised 5/7/97

TABLE 6.2 SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC Agency Field Sampling

PRE-CONSTRUCTION

Page 1/2

Section	Description	Sample Numbers
370901	subgrade sample	BS01A01, MS01A01
370902	subgrade sample	BS01A02, MS01A02
370903	subgrade sample	BS01A03, MS01A03
DURING C	ONSTRUCTION	
370901	2-19 litre pails of AC-20 10-19 litre pails of	BC01A01 (Agency & MRL)
	combined aggregate 6-split-off GC samples	BU01A01 (MRL)
	of surface course HMAC	BA01A01-BA06A01 (Agency QC/QA)
370902	2-19 litre pails of PG 64-22 10-19 litre pails of combined aggregate - Superpave	BC01A02 (Agency & MRL)
	surface course mix 34-split-off GC samples	BU01A02 (MRL)
	of surface course mix 3-split-off GC samples	BA01A02-BA34A02 (Agency GC Specimen)
	of binder course mix	BA51A02-BA53A02 (Agency QC/QA)
	3-split-off GC samples of base course mix 12-6" dia x 12" cylindrical molds filled with binder	BA71A02-BA73A02 (Agency QC/QA)
	course hot mix	BA50A02 (MRL)
	12-6" dia x 12" cylindrical molds filled with base course hot mix	BA70A02 (MRL)
370903	2-19 litre pails of PG 70-22 6-split-off GC samples of	BC01A03 (Agency & MRL)
	surface course mix	BA01A03-BA06A03 (Agency QC/QA)

FHWA-LTPP-NARO

Revised 5/7/97

TABLE 6.2 (Cont.) SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC Agency Field Sampling, Cores

POST-CONSTRUCTION

Page 2/2

Section	Description	A=0 Months	B=6 Months	C=12 Months	D=18 Months	E=24 Months	F=48 Months
370901	152mm dia cores	CA01A01-CA08A01	CA01B01-CA08B01	CA01C01-CA08C01	CA01D01-CA08D01	CA01E01-CA08E01	CA01F01-CA08F01
370902	152mm dia cores	CA01A02-CA34A02 See Note	CA01B02-CA08B02	CA01C02-CA08C02	CA01D02-CA08D02	CA01E02-CA08E02	CA01F02-CA08F02
370903	152mm dia cores	CA01A03-CA08A03	CA01B03-CA08B03	CA01C03-CA08C03	CA01D03-CA08D03	CA01E03-CA08E03	CA01F03-CA08F03

Note:

Do not take cores 01, 04, 08, 09, 10, 12, 13, 17, 18, 20, 22, 26, 27, 29, 30 and 34 until advised

FHWA-LTPP-NARO

TABLE 6.2A SPS-9A PROJECT 370900, HIGHWAY US-1 SOUTHBOUND, SANFORD, NC Agency Field Sampling

PRE-CONSTRUCTION

Page 1/3

Section	Description	Sample Numbers
370960	subgrade samples	BS01A60, MS01A60, BS02A60, MS02A60
370961	subgrade samples	BS01A61, MS01A61, BS02A61, MS02A61
370962	subgrade samples	BS01A62, MS01A62, BS02A62, MS02A62
370963	subgrade samples	BS01A63, MS01A63, BS02A63, MS02A63
370964	subgrade samples	BS01A64, MS01A64, BS02A64, MS02A64
370965	subgrade samples	BS01A65, MS01A65, BS02A65, MS02A65

TABLE 6.2A (Cont.)

SPS-9A PROJECT 370900, HIGHWAY US-1 SOUTHBOUND, SANFORD, NC Agency Field Sampling

DURING-CONSTRUCTION

Page 2/3

Section	Description	Sample Numbers
370960	3-19 litre pails of multigrade PG 76-22 10-19 litre pails of combined	BC01A60 (Agency Testing, Agency Lab Samples, and MRL)
	aggregate (Superpave Surface Mix) 6-split-off GC samples of surface course mix	BU01A60 (Agency Lab Samples) BA01A60-BA06A60 (Agency QC/QA)
370961	3-19 litre pails of PG 64-22	BC01A61 (Agency Testing, Agency Lab Samples, and MRL)
	aggregate (Superpave Surface Mix) 6-split-off GC samples	BU01A61 (Agency Lab Samples)
	of surface course HMAC	BA01A61-BA06A61 (Agency QC/QA)
370962	3-19 litre pails of SBR Mod PG 76-22 10-19 litre pails of combined	BC01A62 (Agency Testing, Agency Lab Samples, and MRL)
	aggregate (Superpave Surface Mix) 6-split-off GC samples of surface course HMAC	BU01A62 (Agency Lab Samples)
	of surface course HWAC	BA01A62-BA06A62 (Agency QC/QA)
370963	3-19 litre pails of AC-20	BC01A63 (Agency Testing, Agency Lab Samples, and MRL)
	30-19 litre pails of combined aggregate (Agency Surface Mix)	BU01A63 (Agency Testing, Agency Lab Samples, and MRL)
	6-split-off GC samples of surface course HMAC	BA01A63-BA06A63 (Agency QC/QA)
370964	3-19 litre pails of SBS Mod PG 76-22 10-19 litre pails of combined	BC01A64 (Agency Testing, Agency Lab Samples, and MRL)
	aggregate (Superpave Surface Mix) 6-split-off GC samples of surface course HMAC	BU01A64 (Agency Lab Samples) BA01A64-BA06A64 (Agency QC/QA)
370965	3-19 litre pails of SBR Mod PG 76-22 30-19 litre pails of combined aggregate (Superpave Surface Mix) 6-split-off GC samples of surface course HMAC	BC01A65 (Agency Testing, Agency Lab Samples, and MRL) BU01A65 (Agency Testing, Agency Lab Samples, and MRL) BA01A65-BA06A65 (Agency QC/QA)

FHWA-LTPP-NARO Revised 2/18/97

TABLE 6.2A (Cont.) SPS-9A PROJECT 370900, HIGHWAY US-1 SOUTHBOUND, SANFORD, NC Agency Field Sampling, Cores

POST-CONSTRUCTION

Page 3/3

Section	Description	A=0 Months	B=6 Months	C=12 Months	D=18 Months	E=24 Months	F=48 Months
370960	152mm dia cores	CA01A60-CA08A60	CA01B60-CA08B60	CA01C60-CA08C60	CA01D60-CA08D60	CA01E60-CA08E60	CA01F60-CA08F60
370961	152mm dia cores	CA01A61-CA08A61	CA01B61-CA08B61	CA01C61-CA08C61	CA01D61-CA08D61	CA01E61-CA08E61	CA01F61-CA08F61
370962	152mm dia cores	CA01A62-CA08A62	CA01B62-CA08B62	CA01C62-CA08C62	CA01D62-CA08D62	CA01E62-CA08E62	CA01F62-CA08F62
370963	152mm dia cores	CA01A63-CA08A63	CA01B63-CA08B63	CA01C63-CA08C63	CA01D63-CA08D63	CA01E63-CA08E63	CA01F63-CA08F63
370964	152mm dia cores	CA01A64-CA08A64	CA01B64-CA08B64	CA01C64-CA08C64	CA01D64-CA08D64	CA01E64-CA08E64	CA01F64-CA08F64
370965	152mm dia cores	CA01A65-CA08A65	CA01B65-CA08B65	CA01C65-CA08C65	CA01D65-CA08D65	CA01E65-CA08E65	CA01F65-CA08F65

FHWA-LTPP-NARO

Revised 2/18/97

TABLE 7

SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC
Agency Laboratory Testing Summary

Laboratory Test	LTPP Test	LTPP Protocol	No. of Tests	Source of Material
New Construction Subgrade				10 kg. Bulk Samples and Jar Samples
Sieve Analysis	SS01	P51	3	BS01A01, BS01A02, BS01A03
Atterberg Limits	SS03	P43	3	BS01A01, BS01A02, BS01A03
Classification	SS04	P52	3	BS01A01, BS01A02, BS01A03
Natural Moisture Content	\$\$09	P49	3	MS01A01, MS01A02, MS01A03

FHWA-LTPP-NARO Revised 2/18/97

TABLE 7A
SPS-9A PROJECT 370900, HIGHWAY US-1 SOUTHBOUND, SANFORD, NC
Agency Laboratory Testing Summary

Laboratory Test	LTPP	LTPP	No. of	Source of Material
	Test	Protocol	Tests	
Existing Pavement Subgrage				10 kg. Bulk Samples and Jar Samples
Sieve Analysis	SS01	P51	12	BS01A60, BS02A60, BS01A61, BS02A61, BS01A62, BS02A62 BS01A63, BS02A63, BS01A64, BS02A64, BS01A65, BS02A65
Atterberg Limits	SS03	P43	12	BS01A60, BS02A60, BS01A61, BS02A61, BS01A62, BS02A62 BS01A63, BS02A63, BS01A64, BS02A64, BS01A65, BS02A65
Classification	SS04	P52	12	BS01A60, BS02A60, BS01A61, BS02A61, BS01A62, BS02A62 BS01A63, BS02A63, BS01A64, BS02A64, BS01A65, BS02A65
Natural Moisture Content	SS09	P49	12	MS01A60, MS02A60, MS01A61, MS02A61, MS01A62, MS02A62 MS01A63, MS02A63, MS01A64, MS02A64, MS01A65, MS02A65
Asphalt Bound Layers				12" Diameter Cores
Core Examination	AC01	P01	12	CA01A60, CA02A60, CA01A61, CA02A61, CA01A62, CA02A62 CA01A63, CA02A63, CA01A64, CA02A64, CA01A65, CA02A65

TABLE 8
SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC
Agency Laboratory Tests on Mix Components

Laboratory Test	LTPP	LTPP	No. of	lo. of Source of Material		
	Test	Protocol	Tests			
Aggregates						
Combined Aggregate Gradation	AG04	P14	2	BU01A01	BU01A02	
Specific Gravity of Co Agg	AG01	P11	2	BU01A01	BU01A02	
Specific Gravity of Fine Agg	AG02	P12	2	BU01A01	BU01A02	
Specific Gravity of Pass 200		AASHTO T100	2	BU01A01	BU01A02	
Coarse Agg Angularity		PA DOT TM621	2	BU01A01	BU01A02	
Fine Agg Angularity		ASTM C1252	2	BU01A01	BU01A02	
Toughness		AASHTO T96	2	BU01A01	BU01A02	
Soundness		AASHTO T104	2	BU01A01	BU01A02	
Deleterious Material		AASHTO T112	2	BU01A01	BU01A02	
Clay Content		AASHTO T176	2	BU01A01	BU01A02	
Thin, Elongated Particles		ASTM D4791	2	BU01A01	BU01A02	
Asphalt Cement*				AC-20	PG64-22	PG70-22
Penetration @ 5 deg C		AASHTO T49	3**	BC01A01	BC01A02	BC01A03
Penetration @ 25 deg , 46 deg C	AE02	P22	6**	BC01A01	BC01A02	BC01A03
Viscosity @ 60 deg , 135 deg C	AE05	P25	12	BC01A01	BC01A02	BC01A03
Specific Gravity @ 16 deg C	AE03	P23	6	BC01A01	BC01A02	BC01A03
Dynamic Shear @ 3 Temps		AASHTO TP5	6	BC01A01	BC01A02	BC01A03
Brookfield Viscosity 135 deg , 165 deg C		ASTM D4402	6	BC01A01	BC01A02	BC01A03
Rolling Thin Film (RTFOT)*		AASHTO T240	Note	BC01A01	BC01A02	BC01A03
Dynamic Shear on RTFOT Residue @ 3 Temps *		AASHTO TP5	6	BC01A01	BC01A02	BC01A03
Pressure Aging (PAV) of RTFOT Residue*		AASHTO PP1	Note	BC01A01	BC01A02	BC01A03
Creep Stiffness of PAV Residue (2 Temps) - 24h Conditioning*		AASHTO TP1	6	BC01A01	BC01A02	BC01A03
Creep Stiffness of PAV Residue (2 Temps)*		AASHTO TP1	6	BC01A01	BC01A02	BC01A03
Dynamic Shear on PAV Residue (3 Temps)*		AASHTO TP5	6	BC01A01	BC01A02	BC01A03
Direct Tension on PAV Residue (2 Temps)*		AASHTO TP3	6	BC01A01	BC01A02	BC01A03

^{*} Consult SPS-9A Sampling & Testing Guidelines, February 1996 for Quantities and Temperatures

^{**} Three Penetration Readings are required from each test
Note Sufficient material should be conditioned for the required tests

TABLE 8A SPS-9A PROJECT 370900, HIGHWAY US-1 SOUTHBOUND, SANFORD, NC Agency Laboratory Tests on Mix Components

Laboratory Test	LTPP	LTPP	No. of	Source of	Material				
	Test	Protocol	Tests						
Aggregates									
Combined Aggregate Gradation	AG04	P14	2	BU01A63	BU01A65				,
Specific Gravity of Co Agg	AG01	P11	2	BU01A63	BU01A65	-			
Specific Gravity of Fine Agg	AG02	P12	2	BU01A63	BU01A65				
Specific Gravity of Pass 200		AASHTO T100	2	BU01A63	BU01A65		6		
Coarse Agg Angularity		PA DOT TM621	2	BU01A63	BU01A65				
Fine Agg Angularity		ASTM C1252	2	BU01A63	BU01A65				:
Toughness		AASHTO T96	2		BU01A65				
Soundness		AASHTO T104	2	BU01A63	BU01A65				
Deleterious Material		AASHTO T112	2	BU01A63	BU01A65				
Clay Content	1	AASHTO T176	2	BU01A63	BU01A65				
Thin, Elongated Particles		ASTM D4791	2	1	BU01A65				
				PG 76-22	PG 64-22	PG 76-22	AC 20	PG 76-22	PG 70-22
Asphalt Cement*						SBR MOD		SBS MOD	
Penetration @ 5 deg C		AASHTO T49	6**		BC01A61		BC01A63	1	BC01A65
Penetration @ 25 deg , 46 deg C	AE02		12**		BC01A61		1	BC01A64	BC01A65
Viscosity @ 60 deg , 135 deg C	AE05		24	BC01A60			BC01A63		BC01A65
Specific Gravity @ 16 deg C	AE03		12	BC01A60		l e	BC01A63		BC01A65
Dynamic Shear @ 3 Temps		AASHTO TP5	12	BC01A60		•	BC01A63	£	BC01A65
Brookfield Viscosity 135 deg , 165 deg C		ASTM D4402	12		BC01A61	1	L	BC01A64	BC01A65
Rolling Thin Film (RTFOT)*		AASHTO T240	Note	BC01A60			BC01A63		BC01A65
Dynamic Shear on RTFOT Residue @ 3 Temps *		AASHTO TP5	12	BC01A60			BC01A63		BC01A65
Pressure Aging (PAV) of RTFOT Residue*		AASHTO PP1	Note	BC01A60		l .	BC01A63	1	BC01A65
Creep Stiffness of PAV Residue (2 Temps) - 24h Conditioning*		AASHTO TP1	12	i	BC01A61	1		BC01A64	BC01A65
Creep Stiffness of PAV Residue (2 Temps)*		AASHTO TP1	12	BC01A60		i .	BC01A63	1	BC01A65
Dynamic Shear on PAV Residue (3 Temps)*		AASHTO TP5	12	BC01A60		1	BC01A63		BC01A65
Direct Tension on PAV Residue (2 Temps)*		AASHTO TP3	12	BC01A60	BC01A61	BC01A62	BC01A63	BC01A64	BC01A65

^{*} Consult SPS-9A Sampling & Testing Guidelines, February 1996 for Quantities and Temperatures

Note: Sufficient material should be conditioned for the required tests

⁻ Multigrade - SBS Mod PG 76-22 - SBR Mod PG 76-22

^{**} Three penetration readings are required from each test

FHWA-LTPP-NARO

Revised 6/20/97

TABLE 9
SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC
Level 1 Mix Design Testing for DOT and Alternative Superpave Mixes

Laboratory Test	LTPP	LTPP	No. of Tests/	Source of Material (Specimen)
	Test	Protocol	Test Section	
Gyratory Compacted Test Specimen for Sections 370901 and 370903				
 @ Design % AC and N_{Max} % AC Wearing Course (12 5 mm max) 		AASHTO TP4	3	NA01AXX-NA03AXX (LA01AXX-LA03AXX)
@ Design % AC and 7% Air Voids % AC Wearing Course (12 5 mm max)		AASHTO TP4	6	NA04AXX-NA09AXX (LA04AXX-LA09AXX)
Moisture Susceptibility	AC05	P05	1	LA04AXX-LA09AXX
Bulk Specific Gravity	AC02	P02	9	LA01AXX-LA09AXX
Maximum Specific Gravity	AC03	P03	1	NA03AXX
Volumetrics (calculations) Volume Percent of Air Voids		AASHTO PP19	3	LA01AXX-LA03AXX
Percent Voids in Mineral Aggregate		AASHTO PP19	3	LA01AXX-LA03AXX
Voids Filled with Asphalt		AASHTO PP19	3	LA01AXX-LA03AXX

Note 1: For Project 370900 $N_{Int} = 8$, $N_{Design} = 96$, $N_{Max} = 152$, XX represents Sections 01 and 03

Note 2: Section 03 uses same aggregate gradation as in Section 02, Superpave Mix Design but with alternative binder PG 70-22

FHWA-LTPP-NARO

Revised 6/20/97

TABLE 9A
SPS-9A PROJECT 370900, HIGHWAY US-1 SOUTHBOUND, SANFORD, NC
Level 1 Mix Design Testing for DOT and Alternative Superpave Mixes

Laboratory Test	LTPP	LTPP	No. of Tests/	Source of Material (Specimen)
70000	Test	Protocol	Test Section	
Gyratory Compacted Test Specimen				
for Sections 370960, 370961, 370962, 370963, 370964 and 370965				
@ Design % AC and N_{Max}				
% AC Wearing Course (12 5 mm max)		AASHTO TP4	3	NA01AXX-NA03AXX (LA01AXX-LA03AXX)
@ Design % AC and 7% Air Voids				
% AC Wearing Course (12 5 mm max)		AASHTO TP4	6	NA04AXX-NA09AXX (LA04AXX-LA09AXX)
Moisture Susceptibility	AC05	P05	1	LA04AXX-LA09AXX
Bulk Specific Gravity	AC02	P02	9	LA01AXX-LA09AXX
Maximum Specific Gravity	AC03	P03	1	NA03AXX
Volumetrics (calculations)*		:		
Volume Percent of Air Voids		AASHTO PP19	3	LA01AXX-LA03AXX
Percent Voids in Mineral Aggregate		AASHTO PP19	3	LA01AXX-LA03AXX
Voids Filled with Asphalt		AASHTO PP19	3	LA01AXX-LA03AXX

Note 1: For Project 370900 $N_{lat} = 8$, $N_{Design} = 96$, $N_{Max} - 152$, XX represents Sections 60, 61, 62, 63, 64 and 65

Note 2: Sections 60, 62, 64 and 65 use same aggregate gradation as in Section 02, Superpave Mix Design but with alternative binders PG 76-22, SBR MOD PG 76-22, SBS MOD PG 76-22 and PG 70-22 respectively

^{*} For Volumetric Calculations use the Bulk Specific Gravity @ N_{Design} estimated from the Density vs. Gyrations Curves from the N_{Max} specimen

FHWA-LTPP-NARO

Revised 5/7/97

TABLE 10
SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC
Quality Control Field Laboratory Testing of Paver Samples Other Than Superpave AC Mixes

Laboratory Test	LTPP Test	LTPP Protocol	No. of Tests/Layer	Source of Material (Specimen)
Gyratory Compaction @ N $_{Max}$ (Paver Samples) 370900 N $_{Max}$ = 169		AASHTO TP4	6 per test section	B01AXX-B06AXX (DA01AXX-DA06AXX)
Bulk Specific Gravity - G _{mb}	AC02	P02	6 per test section	DA01AXX-DA06AXX
Asphalt Content (Extraction)	AC04	P04	2 per test section	B01AXX, B06AXX
Aggregate Gradation (Extracted Aggregate)	AG04	P14	2 per test section	B01AXX, B06AXX
Maxımum Specific Gravity - G _{mm}	AC03	P03	2 per test section	B01AXX, B06AXX
Volumetrics Volume Percent of Air Voids Percent Voids in Mineral Agg Voids Filled with Asphalt		AASHTO PP19 AASHTO PP19 AASHTO PP19	6 per test section	DA01AXX-DA06AXX

Note $~G_{mb}$ @ N_{Max} < 98% G_{mm} , XX - Section Numbers 01 and 03

Bulk Samples of Surface Courses are *BA01-BA06*GC Specimen Numbers for Surface Courses are *DA01-DA06*

TABLE 10A SPS-9A PROJECT 370900, HIGHWAY US-1 SOUTHBOUND, SANFORD, NC Quality Control Field Laboratory Testing of Paver Samples

Laboratory Test	LTPP	LTPP	No. of	Source of Material (Specimen)
	Test	Protocol	Tests	
Gyratory Compaction @ N _{Mix} (Paver Samples)		AASHTO TP4	6	B01A60-B06A60 (DA01A60-DA06A60)
			per test	B01A61-B06A61 (DA01A61-DA06A61)
			section	B01A62-B06A62 (DA01A62-DA06A62)
				B01A63-B06A63 (DA01A63-DA06A63)
$370900 N_{Max} = 152$				B01A64-B06A64 (DA01A64-DA06A64)
				B01A65-B06A65 (DA01A65-DA06A65)
Bulk Specific Gravity - G _{mb}	AC02	P02	6	DA01A60-DA06A60, DA01A63-DA06A63
			per test	DA01A61-DA06A61, DA01A64-DA06A64
			section	DA01A62-DA06A62, DA01A65-DA06A65
Asphalt Content (Extraction)	AC04	P04	2	B01A60, B06A60, B01A63, B06A63
			per test	B01A61, B06A61, B01A64, B06A64
			section	B01A62, B06A62, B01A65, B06A65
Aggregate Gradation	AG04	P14	2	B01A60, B06A60, B01A63, B06A63
(Extracted Aggregate)	//		per test	B01A61, B06A61, B01A64, B06A64
			section	B01A62, B06A62, B01A65, B06A65
Maximum Specific Gravity - G _{mm}	AC03	P03	2	B01A60, B06A60, B01A63, B06A63
	11005	. 05	per test	B01A61, B06A61, B01A64, B06A64
			section	B01A62, B06A62, B01A65, B06A65
Volumetrics*				
Volume Percent of Air Voids		AASHTO PP19	6	DA01A60-DA06A60, DA01A63-DA06A63
Percent Voids in Mineral Agg		AASHTO PP19	per test	DA01A61-DA06A61, DA01A64-DA06A64
Voids Filled with Asphalt		AASHTO PP19	section	DA01A62-DA06A62, DA01A65-DA06A65

Note. $G_{mb} < 98\% G_{mm}$

^{*} For Volumetric Calculations use the Bulk Specific Gravity @ N_{Design} estimated from the compaction Density vs. Gyrations Curves of N_{Max} specimen

TABLE 11 SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC Superpave Level 3 Mix Testing, Agency Laboratory

Laboratory Test	LTPP	LTPP	No. of	Source of Material (Specimen)
	Test	Protocol	Tests	
Gyratory Compactor @ N _{Max} (Lab Samples)		AASHTO TP4	6	NA01A02-NA06A02 (LA01A02-LA06A02)
Gyratory Compactor @ 3% AV (Lab Samples)		AASHTO TP4	2	NA07A02-NA08A02 (LA07A02-LA08A02)
Gyratory Compactor @ 7% AV (Lab Samples)		AASHTO TP4	32	NA09A02-NA40A02 (LA09A02-LA40A02)
Gyratory Compactor @ 3% AV (Field Samples)		AASHTO TP4	2	BA01A02 BA34A02 (DA01A02, DA34A02)
Gyratory Compactor @ 7% AV (Field Samples)		AASHTO TP4	26	BA05A02-BA30A02 (DA05A02-DA30A02)
Gyratory Compactor @ N _{Max} (Field Samples)		AASHTO TP4	6	BA02A02-BA04A02, BA31A02-BA33A02 (DA02A02-DA04A02, DA31A02-DA33A02)
Bulk Specific Gravity	AC02	P02	24	LA01A02-LA06A02, LA09A02-LA14A02 DA02A02-DA04A02 DA31A02-DA33A02 [LA07A02. LA15A02, LA38A02, DA06A02, DA16A02, DA22A02]
Asphalt Content (Extraction) Aggregate Gradation (Extracted Aggregate) Maximum Specific Gravity Moisture Susceptibility	AC04 AG04 AC03 AC05	P04 P14 P03 P05	3 3 4	BA05A02-BA06A02, BA34A02 BA05A02-BA06A02, BA34A02 NA15A02, BA05A02-BA06A02, NA34A02 LA09A02-LA14A02
Volumetrics** Volume Percent of Air Voids Percent Voids in Mineral Aggregate Voids Filled with Asphalt		AASHTO PP19 AASHTO PP19 AASHTO PP19	12 12 12	Same Specimen for All Volumetrics LA01A02-LA06A02, DA02A02-DA04A02, DA31A02-DA33A02 Same Same

Bulk Paver Samples in 370902 are approximately 70kg (12 or more compacted specimens from each sample) See Notes on Preparation of Gyratory Compacted Test Specimen attached $N_{Max} = 169$

^{**} The corrected bulk density at NDesign shall be estimated from the gyratory compaction curves, Density vs Gyrations to N_{Max} for calculation of the volumetric properties

^[] These specimens are then included in the shipment with other Gyratory Compacted Samples to the LTPP Contractor Laboratory, Law Engineering and the Superpave Regional Test Center (Note) for SRTC substitute Materials Reference Library (MRL)

TABLE 12 SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC Superpave Level 3 Mix Testing, LTPP Contractor Laboratory

Laboratory Test		LTPP	No. of	Source of Material
	Test	Protocol	Tests	
Creep Compliance	AC06	P06	12	LA19A02-LA22A02 DA15A02, DA16A02, DA18A02, DA30A02 CA03A02, CA14A02, CA23A02, CA32A02
Indirect Tensile Strength	AC07	P07	12	LA15A02-LA18A02 DA05A02, DA09A02, DA17A02, DA29A02 CA07A02, CA16A02, CA21A02, CA31A02
Resilient Modulus	AC07	P07	3	LA16A02-LA18A02 DA09A02, DA17A02, DA29A02 CA16A02, CA21A02, CA31A02

Note 100mm dia test specimen will be cored from the 152mm dia specimen and cores

FHWA-LTPP-NARO

Revised 5/7/97

TABLE 13
SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC
Superpave Level 3 Mix Testing, Superpave Regional Test Center (For SRTC Substitute MRL)

Laboratory Test	LTPP Protocol	No. of Tests	Source of Material/Product	
Frequency Sweep at Constant Height	AASHTO M-003, P-005	10	LA23A02-LA26A02	
	SST-1		DA06A02, <i>DA10A02</i> , DA24A02, DA28A02	
Simple Shear at Constant Height	AASHTO M-003, P-005		CA04A02, CA30A02	
	SST-1			
Uniaxial Strain	AASHTO M-003, P-005	10	LA27A02-LA30A02	
	SST-2		DA07A02, DA11A02, DA23A02, DA27A02	
Volumetric Test	AASHTO M-003, P-005		CA12A02, CA22A02	
	SST-2			
Repeated Shear at Constant Stress Ratio	AASHTO M-003, P-005	6	LA07A02, LA08A02	
	SST-3		DA01A02, DA34A02 CA09A02, CA26A02	
Indirect Tensile Creep Compliance	AASHTO M-005	30	LA31A02-LA40A02	
	SP-IT	,	DA08A02, DA12A02-DA14A02	
Indirect Tensile Strength	AASHTO M-005	1	DA19A02-DA22A02, DA25A02, DA26A02	
Inducer rensue sucugar	Thomas in our		CA01A02, CA08A02, CA10A02, CA13A02	
	SP-IT		CA17A02-CA18A02, CA20A02, CA27A02 CA29A02, CA34A02	

Note: The Gyratory Compacted Specimens from Laboratory Prepared Mix (LA) and Plant Mix (DA) are to be sent to the MRL for storage until revised Laboratory Testing is Finalized

TABLE 14

Bulk Material Samples to be Shipped to the LTPP Materials Reference Library (MRL) 1625 Crane Way, Sparks, NV, 89431 from Project 370900

Material	Number
Asphalt cement collected from the plant in 19-litre pails	1 for each type of binder
Combined coarse and fine aggregate obtained from the plant and stored in 19-litre pails	10 for each aggregate combination
HMAC binder course mix in 12-6" dia. x 12" high cylinders	Mount on plywood pallet approx. 350 lbs.
HMAC base course mix in 12-6" dia. x 12" high cylinders	Mount on plywood pallet approx 350 lbs.

Notes:

The MRL will provide containers and will pay for shipping costs

Contact the MRL @ (702) 358-7574 prior to construction to make arrangements for sample containers and to receive specific shipping instructions. The contact person is Mr. Jim Nichols.

Only one sample of each unique asphalt binder used in the SPS-9A mixes is needed. If the same binder is used in more than one mix, then only one sample of that binder should be obtained.

A copy of LTPP Field Operations Information Form 1 should be completed and attached to all MRL shipments A copy of the form should be mailed separately to the MRL. Mail other completed copy to Mr Alfred Lip at the LTPP Regional office, 415 Lawrence Bell Drive, Suite 3, Amherst, NY, 14221 - telephone (716) 632-0804.

See also Table 13

TABLE 14A

Bulk Material Samples to be Shipped to the LTPP Materials Reference Library (MRL) 1625 Crane Way, Sparks, NV, 89431 from Project 370900

Material	Number
Asphalt cement collected from the plant in 19-litre pails	l for each type of binder
Combined coarse and fine aggregate obtained from the plant and stored in 19-litre pails	10 for each aggregate combination

Notes:

The MRL will provide containers and will pay for shipping costs.

Contact the MRL @ (702) 358-7574 prior to construction to make arrangements for sample containers and to receive specific shipping instructions. The contact person Is Mr Jim Nichols/Rodney Soule.

Only one sample of each unique asphalt binder used in the SPS-9A mixes is needed. If the same binder is used in more than one mix, then only one sample of that binder should be obtained.

A copy of LTPP Field Operations Information Form 1 should be completed and attached to all MRL shipments. A copy of the form should be mailed separately to the MRL. Mail other completed copy to Mr. Alfred Lip at the LTPP Regional office, 415 Lawrence Bell Drive, Suite 3, Amherst, NY, 14221 - telephone (716) 632-0804.

TABLE 15
SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC
Agency Laboratory Tests on Cores Taken at Time A=O

Laboratory Test	LTPP	LTPP	No. of	Source of Material
	Test	Protocol	Tests	
Core Examination/Thickness	AC01	P01	34	All Cores
Bulk Specific Gravity	AC02	P02	24	CA02A02, CA06A02, CA11A02, CA15A02, CA19A02, CA24A02, CA28A02, CA33A02 and All Cores from Sections 01, 03
Maximum Specific Gravity	AC03	P03	6	CA11A02, CA24A02, CA01AXX, CA08AXX
Asphalt Content (Extraction)	AC04	P04	24	CA02A02, CA06A02, CA11A02, CA15A02, CA19A02, CA24A02, CA28A02, CA33A02 and All Cores from Sections 01, 03
Aggregate Gradation (Extracted Agg)	AG04	P14	6	CA11A02, CA24A02 and CA01AXX, CA08AXX
Volumetrics Volume Percent of Air Voids Percent Voids in Mineral Aggregate Voids Filled with Asphalt		AASHTO PP19 AASHTO PP19 AASHTO PP19	6 6	CA11A02, CA24A02 and CA01AXX. CA08AXX CA11A02, CA24A02 and CA01AXX, CA08AXX CA11A02, CA24A02 and CA01AXX, CA08AXX
Recovered Asphalt Cement Abson Recovery	AE01	P21	24	CA02A02, CA06A02 CA11A02, CA15A02, CA19A02, CA24A02, CA28A02 and CA01AXX-CA08AXX
Penetration @ 5 deg C Penetration @ 25 deg C and 46 deg C Viscosity @ 60 deg C and 135 deg C Specific Gravity @ 16 deg C Dynamic Shear @ 3 Temperatures** Creep Stiffness @ 2 Temperatures** Direct Tension @ 2 Temperatures**	AE02 AE05 AE03	AASHTO T49 P22 P25 P23 AASHTO TP5 AASHTO TP1 AASHTO TP3	3* 6* 12 6 6 6	Combined Sample from Each Test Section

XX are for test sections 01 and 03

^{*} Three penetration readings are required from each test

^{**} The test temperatures should be the same as those used for the tests on the RTFOT-PAV conditioned samples

TABLE 15A
SPS-9A PROJECT 370900, HIGHWAY US-1 SOUTHBOUND, SANFORD, NC
Agency Laboratory Tests on Cores Taken at Time A=O

Laboratory Test	LTPP	LTPP	No. of	Source of Material
	Test	Protocol	Tests	
Core Examination/Thickness	AC01	P01	48	All Cores
Bulk Specific Gravity	AC02	P02	48	All Cores
Maximum Specific Gravity	AC03	P03	12	CA01AXX, CA08AXX
Asphalt Content (Extraction)	AC04	P04	48	All Cores
Aggregate Gradation (Extracted Agg)	AG04	P14	12	CA01AXX, CA08AXX
Volumetrics				
Volume Percent of Air Voids		AASHTO PP19	12	CA01AXX, CA08AXX
Percent Voids in Mineral Aggregate		AASHTO PP19	12	CA01AXX, CA08AXX
Voids Filled with Asphalt		AASHTO PP19	12	CA01AXX, CA08AXX
Recovered Asphalt Cement				
Abson Recovery	AE01	P21	48	CA01AXX-CA08AXX
Penetration @ 5 deg C		AASHTO T49	6*	Combined Sample from each Test Section
Penetration @ 25 deg C and 46 deg C	AE02	P22	12*	Combined Sample from each Test Section
Viscosity @ 60 deg C and 135 deg C	AE05	P25	24	Combined Sample from each Test Section
Specific Gravity @ 16 deg C	AE03	P23	12	Combined Sample from each Test Section
Dynamic Shear @ 3 Temperatures**	l	AASHTO TP5	12	Combined Sample from each Test Section
		AASHTO TPI	12	Combined Sample from each Test Section
		AASHTO TP3	12	Combined Sample from each Test Section
Creep Stiffness @ 2 Temperatures** Direct Tension @ 2 Temperatures**			1	

XX are for test sections 60, 61, 62, 63, 64 and 65

^{*} Three penetration readings are required for each test

^{**} The test temperatures should be the same as those used for the RTFOT-PAV conditioned samples performed during initial binder grading

TABLE 16 SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC Post Construction Monitoring Tests on All Sections - Agency Laboratory

Cores at Time Intervals B Through F (6, 12, 18, 24, 48 Months)

Laboratory Test	LTPP	LTPP	No. of	Source of Material
	Test	Protocol	Tests	
Core Examination/Thickness	AC01	P01	24 per time interval	All Cores from All Sections
Bulk Specific Gravity	AC02	P02	24	All Cores from All Sections
Maximum Specific Gravity	AC03	P03	6	(CA01tXX, CA08tXX), All Sections
Asphalt Content (Extraction)	AC04	P04	24	All Cores from All Sections
Aggregate Gradation (Extracted Agg)	AG04	P14	6	(CA01t01 CA08t01), (CA01t02, CA08t02). (CA01t03, CA08t03)
Volumetrics*				
Volume Percent of Air Voids		AASHTO PP19	6	CA01tXX, CA08tXX
Percent Voids in Mineral Aggregate		AASH FO PP19	6	CA01tXX, CA08tXX
Voids Filled with Asphalt		AASHTO PP19	6	CA01tXX, CA08tXX
Recovered Asphalt Cement				
Abson Recovery	AE01	P21	24	All Cores
Penetration @ 5 deg C		AASHTO T49	3***	Combined Recovered AC from Each Section
Penetration @ 25 deg C and 46 deg C	AE02	P22	6***	Combined Recovered AC from Each Section
Viscosity @ 60 deg C and 135 deg C	AE05	P25	12	Combined Recovered AC from Each Section
Specific Gravity @ 16 deg C	AE03	P23	6	Combined Recovered AC from Each Section
Dynamic Shear @ 3 Temperatures**		AASHTO TP5	6	Combined Recovered AC from Each Section
Creep Stiffness @ 2 Temperatures**		AASHTO TP1	6	Combined Recovered AC from Each Section
Direct Tension @ 2 Temperatures**		AASHTO TP3	6	Combined Recovered AC from Each Section

^{*} Estimate max theoretical specific gravity using extracted AC content and aggregate effective S G determined during construction

^{**} The test temperatures should be the same as those used for the tests on the RTFOT-PAV conditioned samples performed during the initial binder grading

^{***} Three penetration readings are required from each test

TABLE 16A SPS-9A PROJECT 370900, HIGHWAY US-1 SOUTHBOUND, SANFORD, NC Post Construction Monitoring Tests on All Sections - Agency Laboratory Cores at Time Intervals B Through F (6, 12, 18, 24, 48 Months)

Laboratory Test	LTPP	LTPP	No. of	Source of Material
_	Test	Protocol	Tests	
Core Examination/Thickness	AC01	P01	48 per time	All Cores from All Sections
Bulk Specific Gravity	AC02	P02	interval 48	All Cores from All Sections
Maximum Specific Gravity	AC03	P03	12	CA01tXX, CA08tXX (All Sections)
Asphalt Content (Extraction)	AC04	P04	48	All Cores from All Sections
Aggregate Gradation (Extracted Agg)	AG04	P14	12	(CA01t60, CA08t60), (CA01t61, CA08t61), (CA01t62, CA08t62), (CA01t63, CA08t63) (CA01t64, CA08t64), (CA01t65, CA08t65)
Volumetrics*				
Volume Percent of Air Voids		AASHTO PP19	12	CA01tXX, CA08tXX (All Sections)
Percent Voids in Mineral Aggregate		AASHTO PP19	12	CA01tXX, CA08tXX (All Sections)
Voids Filled with Asphalt		AASHTO PP19	12	CA01tXX, CA08tXX (All Sections)
Recovered Asphalt Cement				
Abson Recovery	AE01	P21	48	All Cores
Penetration @ 5 deg C		AASHTO T49	6***	Combined Recovered AC from Each Section
Penetration @ 25 deg C and 46 deg C	AE02	P22	12***	Combined Recovered AC from Each Section
Viscosity @ 60 deg C and 135 deg C	AE05	P25	24	Combined Recovered AC from Each Section
Specific Gravity @ 16 deg C	AE03	P23	12	Combined Recovered AC from Each Section
Dynamic Sheai @ 3 Temperatures**		AASHTO TP5	12	Combined Recovered AC from Each Section
Creep Stiffness @ 2 Temperatures**		AASHTO TP1	12	Combined Recovered AC from Each Section
Direct Tension @ 2 Temperatures**		AASHTO TP3	12	Combined Recovered AC from Each Section

^{*} Estimate max theoretical specific gravity using extracted AC content and aggregate effective S G. determined during construction

^{**} The test temperatures should be the same as those used for the tests on the RTFOT-PAV conditioned samples performed during the initial binder grading

^{***} Three penetration readings are required from each test

FHWA-LTPP-NARO

TABLE 17 SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC Laboratory Tracking Table for Subgrade Laboratory: Agency

Sample	Constr.	Offset	Sample	Lab	Description of Sample	Laboratory Ha	ndling & Test S	equencing			
Location	Sta.	Ft.	No.	Test		First	Second	Third	Fourth	Fifth	Sixth
No.			<u> </u>	No.							
Subgrade	!		-								
B90A01	30+00	5	BS01A01	1	10kg Bulk Sample	SS01/P51	SS03/P43	SS04/P52			T.
B90A02	52+50	5	BS01A02	1	10kg Bulk Sample	SS01/P51	SS03/P43	SS04/P52			
B90A03	91+00	5	BS01A03	1	10kg Bulk Sample	SS01/P51	SS03/P43	SS04/P52			<u> </u>
B90A01	30+00	5	MS01A01	1	Moisture Jar Sample	SS09/P49					
B90A02	52+50	5	MS01A02	1	Moisture Jar Sample	SS09/P49					
B90A03	91+00	5	MS01A03	1	Moisture Jar Sample	SS09/P49			1		
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Revised 2/18/97

FHWA-LTPP-NARO

TABLE 17A SPS-9A PROJECT 370900, HIGHWAY US-1 SOUTHBOUND, SANFORD, NC Laboratory Tracking Table for Subgrade Laboratory: Agency

Sample	Constr.	Offset	Sample	Lab	Description of Sample	Laboratory Ha	andling & Test S	Sequencing			
Location	Sta.	Ft.	No.	Test	-	First	Second	Third	Fourth	Fifth	Sixth
No.				No.			<u> </u>				
Subgrade											
A01A60	96+75	3	BS01A60	1	10 kg Bulk Sample	SS01/P51	SS03/P43	SS04/P52			
A02A60	91+25	3	BS02A60	2	10 kg Bulk Sample	SS01/P51	SS03/P43	SS04/P52			
A01A61	82+75	3	BS01A61	1	10 kg Bulk Sample	SS01/P51	SS03/P43	SS04/P52			
A02A61	77+25	3	BS02A61	2	10 kg Bulk Sample	SS01/P51	SS03/P43	SS04/P52			
A01A62	68+75	3	BS01A62	1	10 kg Bulk Sample	SS01/P51	SS03/P43	SS04/P52			
A02A62	63+25	3	BS02A62	2	10 kg Bulk Sample	SS01/P51	SS03/P43	SS04/P52			
A01A63	54+75	3	BS01A63	1	10 kg Bulk Sample	SS01/P51	SS03/P43	SS04/P52			
A02A63	49+25	3	BS02A63	2	10 kg Bulk Sample	SS01/P51	SS03/P43	SS04/P52		ļ	
A01A64	40+75	3	BS01A64	1	10 kg Bulk Sample	SS01/P51	SS03/P43	SS04/P52			
A02A64	35+25	3	BS02A64	2	10 kg Bulk Sample	SS01/P51	SS03/P43	SS04/P52			
A01A65	26+75	3	BS01A65	1	10 kg Bulk Sample	SS01/P51	SS03/P43	SS04/P52			
A02A65	21+25	3	BS02A65	2	10 kg Bulk Sample	SS01/P51	SS03/P43	SS04/P52			
A01A60	96+75	3	MS01A60	1	Moisture Jar Sample	SS09/P49					
A02A60	91+25	3	MS02A60	2	Moisture Jar Sample	SS09/P49					
A01A61	82+75	3	MS01A61	1	Moisture Jar Sample	SS09/P49					
A02A61	77+25	3	MS02A61	2	Moisture Jar Sample	SS09/P49					
A01A62	68+75	3	MS01A62	1	Moisture Jar Sample	SS09/P49			İ		
A02A62	63+25	3	MS02A62	2	Moisture Jar Sample	SS09/P49					
A01A63	54+75	3	MS01A63	1	Moisture Jar Sample	SS09/P49					
A02A63	49+25	3	MS02A63	2	Moisture Jar Sample	SS09/P49					
A01A64	40+75	3	MS01A64	1	Moisture Jar Sample	SS09/P49					
A02A64	35+25	3	MS02A64		Moisture Jar Sample	SS09/P49					
A01A65	26+75	3	MS01A65	i .	Moisture Jar Sample	SS09/P49					
A02A65	21+25	3	MS02A65	1	Moisture Jar Sample	SS09/P49			Ì		

TABLE 18 SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC Laboratory Tracking Table for Combined Aggregate Samples Laboratory: Agency

Sample	Constr.	Offset	Sample	Lab	Description of Sample	Laboratory	Handling & Test	Sequencing			
Location	Sta.	Ft.	No.	Test		First	Second	Third	Fourth	Fifth	Sixth
No.				No.			<u> </u>				
	Plant		BU01A01		400 kg Combined Agg Sample NC Standard Mix	AG04/P14	AG01/P11 AG02/P12 AASHTO T100	l	1	AASHTO T112 AASHTO T176 ASTM D4791	
	Plant		BU01A02	3	400 kg Combined Agg Sample Superpave	AG04/P14	AG01/P11 AG02/P12 AASHTO T100	i		AASHTO T112 AASHTO T176 ASTM D4791	

FHWA-LTPP Revised 10/28/98

TABLE 18A SPS-9A PROJECT 370900, HIGHWAY US-1 SOUTHBOUND, SANFORD, NC Laboratory Tracking Table for Combined Aggregate Samples Laboratory: Agency

Sample	Constr.	Offset	Sample	Lab	Description of Sample	Laboratory	Handling & Test	Sequencing			
Location No.	Sta.	Ft.	No.	Test No.		First	Second	Third	Fourth	Fifth	Sixth
	Plant		BU01A65	3	400 kg Combined Agg Sample Superpave	AG04/P14	AG01/P11 AG02/P12 AASHTO T100	į.	AASHTO T96 AASHTO T104		
	Plant		BU01A63	-	400 kg Combined Agg Sample NC Standard Mix	AG04/P14	AG01/P11 AG02/P12 AASHTO T100		AASHTO T96 AASHTO T104		

TABLE 19 SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC Laboratory Tracking Table for Asphalt Binder Samples Laboratory: Agency

Sample	Constr.	Offset	Sample	Lab	Description of	Laboratory Ha	ndling & Test S	equencing			
Location No.	Sta.	Ft.	No.	Test No.	Sample	First	Second	Third	Fourth	Fifth	Sixth
	Plant		BC01A01	3	19 Litre Sample of AC-20	AASHTO T49 AE02/P22 AE05/P25 AE03/P23	ASTM D4402 ASSHTO TP5	AASHTO T240 AASHTO TP5	AASHTO PP1 AASHTO TP5 AASHTO TP1 AASHTO TP1	AASHTO TP3	
	Plant		BC01A02	3	19 Litre Sample of PG 64-22	AASHTO T49 AE02/P22 AE05/P25 AE03/P23	ASTM D4402 ASSHTO TP5	AASHTO T240 AASHTO TP5	AASHTO PP1 AASHTO TP5 AASHTO TP1 AASHTO TP1	AASHTO TP3	
	Plant		BC01A03	3	19 Litre Sample of PG 70-22	AASHTO T49 AE02/P22 AE05/P25 AE03/P23	ASTM D4402 ASSHTO TP5	AASHTO T240 AASHTO TP5	AASHTO PP1 AASHTO TP5 AASHTO TP1 AASHTO TP1	AASHTO TP3	

TABLE 19A SPS-9A PROJECT 370900, HIGHWAY US-1 SOUTHBOUND, SANFORD, NC Laboratory Tracking Table for Asphalt Binder Samples

Laboratory: Agency

Sample	Constr.	Offset	Sample	Lab	Description of	Laboratory Ha	ndling & Test S	equencing			
Location	Sta.	Ft.	No.	Test	Sample	First	Second	Third	Fourth	Fifth	Sixth
No.				No.							
	Plant		BC01A60	3	19 Litre Sample of PG 76-22	AASHTO T49 AE02/P22	ASTM D4402 ASSHTO TP5	AASHTO T240 AASHTO TP5	AASHTO PP1 AASHTO TP5	AASHTO TP3	
						AE05/P25 AE03/P23			AASHTO TP1 AASHTO TP1		
	Plant		BC01A62	3	19 Litre Sample of SBR Mod PG 76-22	AASHTO T49 AE02/P22 AE05/P25	ASTM D4402 ASSHTO TP5	AASHTO T240 AASHTO TP5	AASHTO PP1 AASHTO TP5 AASHTO TP1	AASHTO TP3	
					0.022	AE03/P23			AASHTO TP1		
	Plant		BC01A63	3	19 Litre Sample of AC-20	AASHTO T49 AE02/P22 AE05/P25 AE03/P23	ASTM D4402 ASSHTO TP5	AASHTO T240 AASHTO TP5	AASHTO PP1 AASHTO TP5 AASHTO TP1 AASHTO TP1	AASHTO TP3	
	Plant		BC01A64	3	19 Litre Sample of SBS Mod PG 76-22	AE03/F23 AE02/P22 AE05/P25 AE03/P23	ASTM D4402 ASSHTO TP5	AASHTO T240 AASHTO TP5	L	AASHTO TP3	
	Plant		BC01A65	3	19 Litre Sample of PG 70-22	AASHTO T49 AE02/P22 AE05/P25 AE03/P23	ASTM D4402 ASSHTO TP5	AASHTO T240 AASHTO TP5	1	AASHTO TP3	
	Plant		BC01A61	3	19 Litre Sample of PG 64-22	AASHTO T49 AE02/P22 AE05/P25 AE03/P23	ASTM D4402 ASSHTO TP5	AASHTO T240 AASHTO TP5	AASHTO PP1 AASHTO TP5 AASHTO TP1 AASHTO TP1	AASHTO TP3	

TABLE 20

SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC Laboratory Tracking Table for Other Than Superpave Laboratory Prepared Mixes Laboratory: Agency

Surface Course Mixes at Design % AC

Sample	Gyratory	Compaction	n	Compacted	Laboratory Handling					
Preparation	At	Specimen	Approx.	Sample	& Test Seq	uencing				
No.		Height	Batch	No.	First	Second	Third	Fourth		
	<u> </u>	mm.	g.	 	-		 	<u> </u>		
NA01A01	N _{Max}	115	4700	LA01A01	AC02/P02	PP-19*				
NA02A01	N _{Max}	115	4700	LA02A01	AC02/P02	PP-19*				
NA03A01	N _{Max}	115	4700	LA03A01	AC02/P02	PP-19*				
NA03A01			2000		AC03/P03					
NA04A01	7 % AV	140	5700	LA04A01	AC02/P02	AC05/P05				
NA05A01	7 % AV	140	5700	LA05A01	AC02/P02	AC05/P05				
NA06A01	7 % AV	140	5700	LA06A01	AC02/P02	AC05/P05				
NA07A01	7 % AV	140	5700	LA07A01	AC02/P02	AC05/P05				
NA08A01	7 % AV	140	5700	LA08A01	AC02/P02	AC05/P05				
NA09A01	7 % AV	140	5700	LA09A01	AC02/P02	AC05/P05				
NA01A03	N _{Max}	115	4700	LA01A03	AC02/P02	PP-19*				
NA02A03	N _{Max}	115	4700	LA02A03	AC02/P02	PP-19*	1			
NA03A03	N _{Max}	115	4700	LA03A03	AC02/P02	PP-19*				
NA03A03					AC03/P03					
NA04A03	7 % AV	140	5700	LA04A03	AC02/P02	AC05/P05				
NA05A03	7 % AV	140	5700	LA05A03	AC02/P02	AC05/P05	1			
NA06A03	7 % AV	140	5700	LA06A03	AC02/P02	AC05/P05		1		
NA07A03	7 % AV	140	5700	LA07A03	AC02/P02	AC05/P05				
NA08A03	7 % AV	140	5700	LA08A03	AC02/P02	AC05/P05				
NA09A03	7 % AV	140	5700	LA09A03	AC02/P02	AC05/P05				

^{*} Use bulk specific gravity N_{Design} estimated from gyrations vs. density plots. Mark the top of GC specimen with a 'T', label the specimen

TABLE 20A

SPS-9A PROJECT 370900, HIGHWAY US-1 SOUTHBOUND, SANFORD, NC Laboratory Tracking Table for Other Than Superpave Laboratory Prepared Mixes Laboratory: Agency

Surface Course Mixes at Design % AC

Page 1/2

Sample	Gyratory	Compaction	n	Compacted	Laboratory	Handling	· · · · · · · · · · · · · · · · · · ·	-
Preparation	At	Specimen	Approx.	Sample	& Test Seq	uencing		
No.	İ	Height	Batch	No.	First	Second	Third	Fourth
		mm.	g.					
NA01A60	N _{Max}	115	4700	LA01A60	AC02/P02	PP-19*		
NA02A60	N _{Max}	115	4700	LA02A60	AC02/P02	PP-19*		
NA03A60	N _{Max}	115	4700	LA03A60	AC02/P02	PP-19*		
NA03A60			2000		AC03/P03			
NA04A60	7 % AV	140	5700	LA04A60	AC02/P02	AC05/P05	ì	ł
NA05A60	7 % AV	140	5700	LA05A60	AC02/P02	AC05/P05		
NA06A60	7 % AV	140	5700	LA06A60	AC02/P02	AC05/P05		
NA07A60	7 % AV	140	5700	LA07A60	AC02/P02	AC05/P05		
NA08A60	7 % AV	140	5700	LA08A60	AC02/P02	AC05/P05		
NA09A60	7 % AV	140	5700	LA09A60	AC02/P02	AC05/P05		
NA01A61	N _{Max}	115	4700	LA01A61	AC02/P02	PP-19*		
NA02A61	N _{Max}	115	4700	LA02A61	AC02/P02	PP-19*		
NA03A61	N _{Max}	115	4700	LA03A61	AC02/P02	PP-19*		
NA03A61					AC03/P03			
NA04A61	7 % AV	140	5700	LA04A61	AC02/P02	AC05/P05		
NA05A61	7 % AV	140	5700	LA05A61	AC02/P02	AC05/P05		ĺ
NA06A61	7 % AV	140	5700	LA06A61	AC02/P02	AC05/P05		
NA07A61	7 % AV	140	5700	LA07A61	AC02/P02	AC05/P05		
NA08A61	7 % AV	140	5700	LA08A61	AC02/P02	AC05/P05		
NA09A61	7 % AV	140	5700	LA09A61	AC02/P02	AC05/P05		
NA01A62	N _{Max}	115	4700	LA01A62	AC02/P02	PP-19*		
NA02A62	N _{Max}	115	4700	LA02A62	AC02/P02	PP-19*		
NA03A62	N _{Max}	115	4700	LA03A62	AC02/P02	PP-19*		
NA03A62					AC03/P03			
NA04A62	7 % AV	140	5700	LA04A62	AC02/P02	AC05/P05		
NA05A62	7 % AV	140	5700	LA05A62	AC02/P02	AC05/P05		
NA06A62	7 % AV	140	5700	LA06A62	AC02/P02	AC05/P05		
NA07A62	7 % AV	140	5700	LA07A62	AC02/P02	AC05/P05		
NA08A62	7 % AV	140	5700	LA08A62	AC02/P02	AC05/P05		
NA09A62	7% AV	140	5700	LA09A62	AC02/P02	AC05/P05		

 $^{^{\}star}$ Use bulk specific gravity N_{Design} estimated from gyrations vs. density plots. Mark the top of GC specimen with a 'T', label the specimen

TABLE 20A (Cont.)

SPS-9A PROJECT 370900, HIGHWAY US-1 SOUTHBOUND, SANFORD, NC Laboratory Tracking Table for Other Than Superpave Laboratory Prepared Mixes Laboratory: Agency

Surface Course Mixes at Design % AC

Page 2/2

Sample	Gyratory	Compaction	n	Compacted	Laboratory	Handling		Page 2/2
Preparation	At	Specimen	Approx.	Sample	& Test Seq	_		
No.	}	Height	Batch	No.	First	Second	Third	Fourth
		mm.	g.					ļ
NA01A63	N _{Max}	115	4700	LA01A60	AC02/P02	PP-19*		
NA02A63	N _{Max}	115	4700	LA02A60	AC02/P02	PP-19*		
NA03A63	N _{Max}	115	4700	LA03A60	AC02/P02	PP-19*		
NA03A63			2000		AC03/P03			
NA04A63	7 % AV	140	5700	LA04A60	AC02/P02	AC05/P05		
NA05A63	7 % AV	140	5700	LA05A60	AC02/P02	AC05/P05		ļ
NA06A63	7 % AV	140	5700	LA06A60	AC02/P02	AC05/P05	:	
NA07A63	7 % AV	140	5700	LA07A60	AC02/P02	AC05/P05		
NA08A63	7 % AV	140	5700	LA08A60	AC02/P02	AC05/P05		
NA09A63	7 % AV	140	5700	LA09A60	AC02/P02	AC05/P05		
NA01A64	N _{Max}	115	4700	LA01A61	AC02/P02	PP-19*		
NA02A64	N _{Max}	115	4700	LA02A61	AC02/P02	PP-19*		
NA03A64	N _{Max}	115	4700	LA03A61	AC02/P02	PP-19*		
NA03A64			2000		AC03/P03			
NA04A64	7 % AV	140	5700	LA04A61	AC02/P02	AC05/P05		
NA05A64	7 % AV	140	5700	LA05A61	AC02/P02	AC05/P05		
NA06A64	7 % AV	140	5700	LA06A61	AC02/P02	AC05/P05	1	ļ
NA07A64	7 % AV	140	5700	LA07A61	AC02/P02	AC05/P05		
NA08A64	7 % AV	140	5700	LA08A61	AC02/P02	AC05/P05		
NA09A64	7 % AV	140	5700	LA09A61	AC02/P02	AC05/P05		
NA01A65	N _{Max}	115	4700	LA01A62	AC02/P02	PP-19*		
NA02A65	N _{Max}	115	4700	LA02A62	AC02/P02	PP-19*		
NA03A65	N _{Max}	115	4700	LA03A62	AC02/P02	PP-19*		
NA03A65			2000		AC03/P03			
NA04A65	7 % AV	140	5700	LA04A62	AC02/P02	AC05/P05		
NA05A65	7 % AV	140	5700	LA05A62	AC02/P02	AC05/P05		
NA06A65	7 % AV	140	5700	LA06A62	AC02/P02	AC05/P05		
NA07A65	7 % AV	140	5700	LA07A62	AC02/P02	AC05/P05		
NA08A65	7 % AV	140	5700	LA08A62	AC02/P02	AC05/P05		
NA09A65	7% AV	140	5700	LA09A62	AC02/P02	AC05/P05		

^{*} Use bulk specific gravity N_{Design} estimated from gyrations vs. density plots. Mark the top of GC specimen with a 'T', label the specimen

TABLE 21

SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC Laboratory Tracking Table for Superpave Laboratory Prepared Mixes Laboratory: Agency

Surface Course Mixes at Design % AC

Page 1/2

Sample	Gyratory	Compaction	n	Compacted	Laboratory	Handling		
Preparation	At	Specimen	Approx.	Sample	& Test Seq	uencing		
No.		Height	Batch	No.	First	Second	Third	Fourth
	<u> </u>	mm.	g.	1		1	 	
NA01A02	N _{Max}	115	4700	LA01A02	AC02/P02	PP-19		
NA02A02	N _{Max}	115	4700	LA02A02	AC02/P02	PP-19		
NA03A02	N _{Max}	115	4700	LA03A02	AC02/P02	PP-19		İ
NA04A02	N _{Max}	115	4700	LA04A02	AC02/P02	PP-19		
NA05A02	N _{Max}	115	4700	LA05A02	AC02/P02	PP-19		
NA06A02	N _{Max}	115	4700	LA06A02	AC02/P02	PP-19		
NA07A02	3 % AV	140	5700	LA07A02	AC02/P02	SRTC		
NA08A02	3 % AV	140	5700	LA08A02	SRTC	! 		
NA09A02	7 % AV	140	5700	LA09A02	AC02/P02	AC05/P05		
NA10A02	7 % AV	140	5700	LA10A02	AC02/P02	AC05/P05		
NA11A02	7 % AV	140	5700	LA11A02	AC02/P02	AC05/P05		
NA12A02	7 % AV	140	5700	LA12A02	AC02/P02	AC05/P05		
NA13A02	7 % AV	140	5700	LA13A02	AC02/P02	AC05/P05		
NA14A02	7 % AV	140	5700	LA14A02	AC02/P02	AC05/P05		
NA15A02	7 % AV	140	5700	LA15A02	AC02/P02	LCL		
NA15A02		:	2000		AC03/P03			
NA16A02	7 % AV	140	5700	LA16A02	LCL			
NA17A02	7 % AV	140	5700	LA17A02	LCL			
NA18A02	7 % AV	140	5700	LA18A02	LCL			
NA19A02	7 % AV	140	5700	LA19A02	LCL			
NA20A02	7 % AV	140	5700	LA20A02	LCL			
NA21A02	7 % AV	140	5700	LA21A02	LCL			
NA22A02	7 % AV	140	5700	LA22A02	LCL			
NA23A02	7 % AV	140	5700	LA23A02	SRTC			
NA24A02	7 % AV	140	5700	LA24A02	SRTC			1
NA25A02	7 % AV	140	5700	LA25A02	SRTC			
NA26A02	7 % AV	140	5700	LA26A02	SRTC			

LCL - LTPP Contractor Laboratory

SRTC - Superpave Regional Test Center (For SRTC Substitute MRL)

MRL - Materials Reference Library

TABLE 21 (Cont.)

SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC Laboratory Tracking Table for Superpave Laboratory Prepared Mixes Laboratory: Agency

Surface Course Mixes at Design % AC

Page 2/2

Sample	Gyratory	Compaction	n	Compacted	Laboratory	Handling		
Preparation	At	Specimen	Approx.	Sample	& Test Seq	uencing		
No.		Height	Batch	No.	First	Second	Third	Fourth
		mm.	g.					
NA27A02	7 % AV	140	5700	LA27A02	SRTC			
NA28A02	7 % AV	140	5700	LA28A02	SRTC			
NA29A02	7 % AV	140	5700	LA29A02	SRTC			
NA30A02	7 % AV	140	5700	LA30A02	SRTC			
NA31A02	7 % AV	140	5700	LA31A02	SRTC			
NA32A02	7 % AV	140	5700	LA32A02	SRTC			
NA33A02	7 % AV	140	5700	LA33A02	SRTC			
NA34A02	7 % AV	140	5700	LA34A02	SRTC			
NA35A02	7 % AV	140	5700	LA35A02	SRTC			
NA36A02	7 % AV	140	5700	LA36A02	SRTC			
NA37A02	7 % AV	140	5700	LA37A02	SRTC			
NA38A02	7 % AV	140	5700	LA38A02	AC02/P02	SRTC		
NA39A02	7 % AV	140	5700	LA39A02	SRTC			
NA40A02	7 % AV	140	5700	LA40A02	SRTC			

SRTC - Superpave Regional Test Center (For SRTC Substitute MRL)

MRL - Materials Reference Library

TABLE 22.1 SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC Laboratory Tracking Table for Quality Control - Other than Superpave AC Mixes Laboratory: Agency/Contractor (Field)

Sample	Constr.	Offset	Sample	Lab	Description of Sample	Laboratory Hand	lling & Test S	Sequencing			
Location No.	Sta.	Ft.	No.	Test No.		First	Second	Third	Fourth	Fifth	Sixth
B01A01			BA01A01	3	Uncompacted Mix Sample	AC03/P03	AC04/P04	AG04/P14			
B06A01			BA06A01	3	Uncompacted Mix Sample	AC03/P03	AC04/P04	AG04/P14			
B01A01			DA01A01	3	Gyratory Compactor @ N _{Max}	AASHTO TP4	AC02/P02	PP19			
B02A01			DA02A01	3	Gyratory Compactor @ N _{Max}	AASHTO TP4	AC02/P02	PP19			
B03A01			DA03A01	3	Gyratory Compactor @ N _{Max}	AASHTO TP4	AC02/P02	PP19			
B04A01			DA04A01	3	Gyratory Compactor @ N _{Max}	AASHTO TP4	AC02/P02	PP19			
B05A01			DA05A01	3	Gyratory Compactor @ N _{Max}	AASHTO TP4	AC02/P02	PP19			
B06A01			DA06A01	3	Gyratory Compactor @ N _{Max}	AASHTO TP4	AC02/P02	PP19			
B01A03			BA01A03	3	Uncompacted Mix Sample	AC03/P03	AC04/P04	AG04/P14			
B06A03			BA06A03	3	Uncompacted Mix Sample	AC03/P03	AC04/P04	AG04/P14			
B01A03			DA01A03	3	Gyratory Compactor @ N _{Max}	AASHTO TP4	AC02/P02	PP19			
B02A03			DA02A03	3	Gyratory Compactor @ N _{Max}	AASHTO TP4	AC02/P02	PP19			
B03A03			DA03A03	3	Gyratory Compactor @ N _{Max}	AASHTO TP4	AC02/P02	PP19	}		
B04A03			DA04A03	3	Gyratory Compactor @ N _{Max}	AASHTO TP4	AC02/P02	PP19			Ċ
B05A03			DA05A03	3	Gyratory Compactor @ N _{Max}	AASHTO TP4	AC02/P02	PP19			
B06A03			DA06A03	3	Gyratory Compactor @ N _{Max}	AASHTO TP4	AC02/P02	PP19			

TABLE 22.1A

SPS-9A PROJECT 370900, HIGHWAY US-1 SOUTHBOUND, SANFORD, NC Laboratory Tracking Table for Quality Control - AC Overlay Mixes Other than Superpave Laboratory: Agency/Contractor (Field)

Page 1/2

Sample	Constr.	Offset	Sample	Lab	Description of Sample	Laboratory Handling & Test Sequencing							
Location	Sta.	Ft.	No.	Test		First	Second	Third	Fourth	Fifth	Sixth		
No.				No.			<u> </u>				<u> </u>		
B01A61	N/A	N/A	BA01A61	3	Paver Samples		AC04/P04	AG04/P14					
B06A61			BA06A61	3	Paver Samples	AC03/P03	AC04/P04	AG04/P14					
B01A61			DA01A61	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19					
B02A61			DA02A61	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19		ļ			
B03A61			DA03A61	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19			İ		
B04A61			DA04A61	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19					
B05A61			DA05A61	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19					
B06A61			DA06A61	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19					
B01A60	N/A	N/A	BA01A60	3	Paver Samples	AC03/P03	AC04/P04	AG04/P14					
B06A60			BA06A60	3	Paver Samples	AC03/P03	AC04/P04	AG04/P14			1		
B01A60			DA01A60	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19			1		
B02A60			DA02A60	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19					
B03A60	ļ		DA03A60	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19					
B04A60			DA04A60	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19					
B05A60			DA05A60	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19		İ			
B06A60			DA06A60	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19					
B01A62	N/A	N/A	BA01A62	3	Paver Samples	AC03/P03	AC04/P04	AG04/P14					
B06A62			BA06A62	3	Paver Samples	AC03/P03	AC04/P04	AG04/P14					
B01A62			DA01A62	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19					
B02A62			DA02A62	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19					
B03A62			DA03A62	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19					
B04A62			DA04A62	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19					
B05A62			DA05A62	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19	Ì				
B06A62			DA06A62	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19					

TABLE 22.1A (Cont.)

SPS-9A PROJECT 370900, HIGHWAY US-1 SOUTHBOUND, SANFORD, NC Laboratory Tracking Table for Quality Control - AC Overlay Mixes Other than Superpave Laboratory: Agency/Contractor (Field)

Page 2/2

Constr.	Offset	Sample	Lab	Description of Sample	Laboratory Hand	lling & Test S	Sequencing			-
Sta.	Ft.	No.	Test		First	Second	Third	Fourth	Fifth	Sixth
			No.							<u> </u>
N/A	N/A	BA01A63	3	Paver Samples	AC03/P03	AC04/P04	AG04/P14		:	
		BA06A63	3	Paver Samples	AC03/P03	AC04/P04	AG04/P14			ŀ
		DA01A63	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19			1
		DA02A63	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19	1		
		DA03A63	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19			
		DA04A63	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19			
		DA05A63	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19			
		DA06A63	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19			
N/A	N/A	BA01A64	3	Paver Samples	AC03/P03	AC04/P04	AG04/P14			
		BA06A64	3	Paver Samples	AC03/P03	AC04/P04	AG04/P14			
		DA01A64	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19			
		DA02A64	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19			
	ļ	DA03A64	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19	1		
		DA04A64	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19			
		DA05A64	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19			
		DA06A64	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19			
N/A	N/A	BA01A65	3	Paver Samples	AC03/P03	AC04/P04	AG04/P14			
		BA06A65	3	Paver Samples	AC03/P03	AC04/P04	AG04/P14	İ	İ	
		DA01A65	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19	ŀ	}	
		DA02A65	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19	ŀ	1	
		DA03A65	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19			
		DA04A65	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19	1		1
		DA05A65	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19			
		DA06A65	3	Compacted at N _{Max}	AASHTO TP4	AC02/P02	PP19			
	N/A	N/A N/A N/A N/A	Sta. Ft. No. N/A N/A BA01A63 BA06A63 DA01A63 DA02A63 DA03A63 DA05A63 DA05A63 DA06A63 N/A N/A BA01A64 BA06A64 DA01A64 DA02A64 DA02A64 DA05A64 DA05A64 DA06A64 N/A N/A BA01A65 BA06A65 DA01A65 DA02A65 DA03A65 DA04A65 DA05A65	Sta. Ft. No. Test No. N/A N/A BA01A63 3 BA06A63 3 3 DA01A63 3 3 DA02A63 3 3 DA04A63 3 3 DA05A63 3 3 DA05A63 3 3 DA06A63 3 3 DA06A63 3 3 DA06A64 3 3 DA01A64 3 3 DA02A64 3 3 DA04A64 3 3 DA05A64 3 3 DA06A64 3 3 DA06A64 3 3 DA06A65 3 3 DA02A65 3 3 DA04A65 3 3	Sta. Ft. No. Test No. N/A N/A BA01A63 3 Paver Samples BA06A63 3 Paver Samples Compacted at N _{Max} DA01A63 3 Compacted at N _{Max} DA03A63 3 Compacted at N _{Max} DA04A63 3 Compacted at N _{Max} DA05A63 3 Compacted at N _{Max} DA06A63 3 Compacted at N _{Max} N/A N/A BA01A64 3 Paver Samples DA01A64 3 Paver Samples Compacted at N _{Max} DA02A64 3 Compacted at N _{Max} DA03A64 Compacted at N _{Max} DA04A64 3 Compacted at N _{Max} Compacted at N _{Max} DA05A64 3 Compacted at N _{Max} Compacted at N _{Max} DA01A65 3 Paver Samples Compacted at N _{Max} DA01A65 3 Compacted at N _{Max} Compacted at N _{Max} DA03A65 3 Compacted at N _{Max} DA03A65 3 Compacted at N _{Max} DA04A65 3 Compacted at N _{Max} DA03A65 3 Compacted at N _{Max}	Sta. Ft. No. Test No. First N/A N/A BA01A63 3 Paver Samples AC03/P03 BA06A63 3 Paver Samples AC03/P03 DA01A63 3 Compacted at N _{Max} AASHTO TP4 DA03A63 3 Compacted at N _{Max} AASHTO TP4 DA04A63 3 Compacted at N _{Max} AASHTO TP4 DA05A63 3 Compacted at N _{Max} AASHTO TP4 DA05A63 3 Compacted at N _{Max} AASHTO TP4 DA06A63 3 Compacted at N _{Max} AASHTO TP4 N/A BA01A64 3 Paver Samples AC03/P03 BA06A64 3 Paver Samples AC03/P03 BA06A64 3 Compacted at N _{Max} AASHTO TP4 DA02A64 3 Compacted at N _{Max} AASHTO TP4 DA03A64 3 Compacted at N _{Max} AASHTO TP4 DA04A64 3 Compacted at N _{Max} AASHTO TP4 DA05A64 3 Compacted at N _{Max} AASHTO TP4 N/A BA01A65 3 Paver Samples AC03/P03 BA06A65 3 Compacted at N _{Max} AASHTO	Ft. No. Test No. First Second	Ft. No. Test No. Test No. Test No. First Second Third	Ft. No. Test No. Test No. First Second Third Fourth Fourth No. First Second Third Fourth Fourth No. First Second Third Fourth Fourth No. First Second Third Fourth Fourth No. First Second Third Fourth Fourth No. First Second Third Fourth Four	Ft. No. Test No. Test No. First Second Third Fourth Fifth Fifth No. First Second Third Fourth Fifth Fourth Fourth Fifth Fourth Fifth Fourth Fifth Fourth Fifth Fourth Fifth Fourth Fifth Fourth Fifth Fourth Fourth Fifth Fourth Fifth Fourth Fifth Fourth Fifth Fourth Fifth Fourth Fifth Fourth Fourth Fourth Fourth Fifth Fourt

TABLE 22.2

SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC Laboratory Tracking Table for Superpave Mixes (Field Samples)

Laboratory: Agency

Page 1/2

Sample	Constr.	Offset	Sample	Lab	Description of Sample	Laboratory Ha	andling & Te	st Sequencing			
Location No.	Sta.	Ft.	No.	Test No.		Specimen Height mm.	Approx. Batch g.	First	Second	Third	Fourth
B01A02			DA01A02	3	GCS Field Sample @ 3% AV	140	5700	AASHTO TP4	SRTC		
B02A02			DA02A02	3	GCS Field Sample @ N _{Max}	115	4700	AASHTO TP4	AC02/P02	PP19	
B03A02			DA03A02	3	GCS Field Sample @ N _{Max}	115	4700	AASHTO TP4	AC02/P02	PP19	
B04A02			DA04A02	3	GCS Field Sample @ N _{Max}	115	4700	AASHTO TP4	AC02/P02	PP19	
B05A02			DA05A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4	LCL		
B06A02			DA06A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4	AC02/P02	SRTC	
B07A02			DA07A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B08A02			DA08A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B09A02			DA09A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4	LCL		
B05A02			BA05A02	3	Uncompacted Plant Mix		2000	AC03/P03	AC04/P04	AG04/P14	
B06A02			BA06A02	3	Uncompacted Plant Mix		2000	AC03/P03	AC04/P04	AG04/P14	
B10A02			DA10A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B11A02			DA11A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B12A02			DA12A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B13A02			DA13A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B14A02			DA14A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B15A02			DA15A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4	LCL		
B16A02			DA16A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4	AC02/P02	LCL	
B17A02			DA17A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4	LCL		
B18A02			DA18A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4	LCL		

Note:

For SRTC Substitute MRL

FHWA-LTPP-NARO

TABLE 22.2 (Cont.) SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC Laboratory Tracking Table for Superpave Mixes (Field Samples) Laboratory: Agency

Page 2/2

Sample	Constr.	Offset	Sample	Lab	Description of Sample	Laboratory H	andling & Te	st Sequencing			
1	Sta.	Ft.	No.	Test No.		Specimen Height mm.	Approx. Batch g.	First	Second	Third	Fourth
B19A02			DA19A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B20A02			DA20A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B21A02	<u> </u>		DA21A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B22A02		1	DA22A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4	AC02/P02	SRTC	
B23A02			DA23A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B24A02			DA24A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B25A02			DA25A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B26A02			DA26A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B27A02			DA27A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B28A02			DA28A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4	SRTC		
B29A02			DA29A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4			
B30A02			DA30A02	3	GCS Field Sample @ 7% AV	140	5700	AASHTO TP4	LCL		
B31A02			DA31A02	3	GCS Field Sample @ N _{Max}	115	4700	AASHTO TP4	AC02/P02	PP19	
B32A02			DA32A02	3	GCS Field Sample @ N _{Max}	115	4700	AASHTO TP4	AC02/P02	PP19	
B33A02			DA33A02	3	GCS Field Sample @ N _{Max}	115	4700	AASHTO TP4	AC02/P02	PP19	
B34A02			DA34A02	3	GCS Field Sample @ 3% AV	140	5700	AASHTO TP4	SRTC		
B34A02	İ		BA34A02	3	Uncompacted Plant Mix		2000	AC03/P03	AC04/P04	AG04/P14	

Note:

QC/QA specimen DA02A02-DA04A02, DA31A02-DA33A02 are compacted in the field from field samples stored in insulated containers. Other specimen are split-off to size in the field while still hot. They are reheated as needed for compaction.

GCS - Gyratory Compacted Specimen

SRTC - Superpave Regional Test Center (For SRTC Substitute MRL)

LCL - LTPP Contractor Laboratory

MRL - Materials Reference Library

TABLE 23

SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC Superpave Regional Test Center - Tracking Table Laboratory Prepared Specimen (*To Be Sent to MRL*)

Page 1/3

GCS#	Test Seque	nce
	First	Second
LA07A02	AC02/P02	SST-3, Repeated Shear @ Constant Stress Ratio
LA08A02	AC02/P02	SST-3, Repeated Shear @ Constant Stress Ratio
LA23A02	AC02/P02	SST-1, Frequency Sweep and Simple Shear
LA24A02	AC02/P02	SST-1, Frequency Sweep and Simple Shear
LA25A02	AC02/P02	SST-1, Frequency Sweep and Simple Shear
LA26A02	AC02/P02	SST-1*
LA27A02	AC02/P02	SST-2, Volumetric and Uniaxial Strain
LA28A02	AC02/P02	SST-2, Volumetric and Uniaxial Strain
LA29A02	AC02/P02	SST-2, Volumetric and Uniaxial Strain
LA30A02	AC02/P02	SST-2*
LA31A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
LA32A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
LA33A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
LA34A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
LA35A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
LA36A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
LA37A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
LA38A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
LA39A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
LA40A02	AC02/P02	SP-IT*

^{*} Extra Sample, DO NOT DISCARD

Note: The 140mm SPECIMEN are to be cut into two replicate specimen and labeled 'A' for the top and 'B' for the bottom of the specimen Mount the bottom of A and the top of B to the moveable top platten of the Shear Tester

Note: These specimens are to be sent to the MRL for storage until SRTC test procedures are finalized

TABLE 23 (Cont.)

SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC Superpave Regional Test Center - Tracking Table

Plant Mix Specimen (To be Sent to MRL)

Page 2/3

GCS#	Test Seque	nce
	First	Second
DA01A02	AC02/P02	SST-3, Repeated Shear @ Constant Stress Ratio
DA34A02	AC02/P02	SST-3, Repeated Shear @ Constant Stress Ratio
DA06A02	AC02/P02	SST-1, Frequency Sweep and Simple Shear
DA10A02	AC02/P02	SST-1, Frequency Sweep and Simple Shear
DA24A02	AC02/P02	SST-1, Frequency Sweep and Simple Shear
DA28A02	AC02/P02	SST-1, Frequency Sweep and Simple Shear
DA07A02	AC02/P02	SST-2, Volumetric and Uniaxial Strain
DA11A02	AC02/P02	SST-2, Volumetric and Uniaxial Strain
DA23A02	AC02/P02	SST-2, Volumetric and Uniaxial Strain
DA27A02	AC02/P02	SST-2, Volumetric and Uniaxial Strain
DA08A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
DA12A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
DA13A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
DA14A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
DA19A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
DA20A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
DA21A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
DA22A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
DA25A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance
DA26A02	AC02/P02	SP-IT, Indirect Tensile Strength & Creep Compliance

Note: These specimens are to be sent to the MRL for storage until SRTC test procedures are finalized

TABLE 23 (Cont.)

SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC

Superpave Regional Test Center - Tracking Table Core At Time A=0 (Do Not Take Until Advised)

Page 3/3

Core	Core	Lab	Handling and	Testing Sequen	ce	
Location #	Sample #	Test #	First	Second	Third	Disposal
C01A02	CA01A02	1	AC01/P01	AC02/P02	SP-IT	No
C08A02	CA08A02	2	AC01/P01	AC02/P02	SP-IT	No
C10A02	CA10A02	1	AC01/P01	AC02/P02	SP-IT	No
C13A02	CA13A02	1	AC01/P01	AC02/P02	SP-IT	No
C17A02	CA17A02	1	AC01/P01	AC02/P02	SP-IT	No
C18A02	CA18A02	1	AC01/P01	AC02/P02	SP-IT	No
C20A02	CA20A02	1	AC01/P01	AC02/P02	SP-IT	No
C27A02	CA27A02	2	AC01/P01	AC02/P02	SP-IT	No
C29A02	CA29A02	2	AC01/P01	AC02/P02	SP-IT	No
C34A02	CA34A02	2	AC01/P01	AC02/P02	SP-IT	No
C04A02	CA04A02	1	AC01/P01	AC02/P02	SST-1	No
C30A02	CA30A02	2	AC01/P01	AC02/P02	SST-1	No
C12A02	CA12A02	1	AC01/P01	AC02/P02	SST-2	No
C22A02	CA22A02	2	AC01/P01	AC02/P02	SST-2	No
C09A02	CA09A02	1	AC01/P01	AC02/P02	SST-3	No
C26A02	CA26A02	2	AC01/P01	AC02/P02	SST-3	No

Notes:

The core specimen shall be tested in the following order:-

- core examination and thickness measurements
- trim and cut core to testing geometry
- determine bulk density
- prepare and mount the sized specimen for noted test
- SP-IT Superpave Indirect Tensile Strength and Creep Compliance
- SST-1 Frequency Sweep and Simple Shear
- SST-2 Volumetric and Uniaxial Strain
- SST-3 Repeated Shear @ Constant Stress Ratio

TABLE 24 SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC LTPP Contractor Laboratory Tracking Table for Gyratory Compacted Laboratory & Field Superpave Mixes

Page 1/2

GCS#	Test Seque	nce		
	First	Second		
LA15A02	AC02/P02	AC07/P07	ITS	Note: Trim the 150mm dia. x 140mm height
LA16A02	AC02/P02	AC07/P07		specimen to 100mm diameter x 65mm
LA17A02	AC02/P02	AC07/P07		height (central portion of specimen)
LA18A02	AC02/P02	AC07/P07		
LA19A02	AC02/P02	AC06/P06		
LA20A02	AC02/P02	AC06/P06		
LA21A02	AC02/P02	AC06/P06		
LA22A02	AC02/P02	AC06/P06		
DA05A02	AC02/P02	AC07/P07	ITS	
DA09A02	AC02/P02	AC07/P07		
DA15A02	AC02/P02	AC06/P06		
DA16A02	AC02/P02	AC06/P06		
DA17A02	AC02/P02	AC07/P07		
DA18A02	AC02/P02	AC06/P06		
DA29A02	AC02/P02	AC07/P07		
DA30A02	AC02/P02	AC06/P06		

TABLE 24 (Cont.)

SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC LTPP Contractor Laboratory - Tracking Table for Cores Core At Time A=O

Page 2/2

Core	Core	Lab	Test Sequence	e		
Location	Sample	Test	First	Second	Third	
#	#	#			 	
C03A02	CA03A02	1	AC01/P01	AC02/P02	AC06/P06	
C07A02	CA07A02	2	AC01/P01	AC02/P02	AC07/P07	ITS
C14A02	CA14A02	1	AC01/P01	AC02/P02	AC06/P06	
C16A02	CA16A02	1	AC01/P01	AC02/P02	AC07/P07	
C21A02	CA21A02	1	AC01/P01	AC02/P02	AC07/P07	
C23A02	CA23A02	2	AC01/P01	AC02/P02	AC06/P06	
C31A02	CA31A02	2	AC01/P01	AC02/P02	AC07/P07	
C32A02	CA32A02	2	AC01/P01	AC02/P02	AC06/P06	

* The visual examination and thickness measurement and bulk density determinations are included in the LTPP Contractor Laboratory Procedures for ACO6/P06 and AC07/P07 Only the top surface layer is tested for Creep Compliance, Resilient Modulus and Indirect Tensile Strength

TRIM CORES TO FORM TEST SPECIMEN 100mm dia x 65mm HEIGHT

TABLE 25

SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC

Laboratory Tracking Table for AC Cores (Mixes other than Superpave)

Laboratory: Agency - at Interval A

Sample	Constr.	Offset	Sample	Lab	Laboratory	Handling &	Testing Seq	uencing					
Location	Sta.	Ft.	No.	Test	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth
No.				No.		<u></u>							
C01A01		3 5	CA01A01	1	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19	Blend	T49
C02A01		20	CA02A01	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Recovered	AE02/P22
C03A01		3 5	CA03A01	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Asphalt	AE05/P25
C04A01		20	CA04A01	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				for	TP5
C05A01		20	CA05A01	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21	<u> </u>			Binder	TP1
C06A01		3 5	CA06A01	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Testing	TP3
C07A01		20	CA07A01	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21					AE03/P23
C08A01		3 5	CA08A01	2	AC01/P01	AC02/P02	AC03/P03	AC04/P04	A301/P21	AG04/P14	PP19		
C01A03		3 5	CA01A03	1	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19	Blend	T49
C02A03		2 0	CA02A03	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Recovered	AE02/P22
C03A03		3 5	CA03A03	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Asphalt	AE05/P25
C04A03		2 0	CA04A03	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				for	TP5
C05A03	ĺ	2 0	CA05A03	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Binder	TP1
C06A03		3 5	CA06A03	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Testing	TP3
C07A03		2 0	CA07A03	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21					AE03/P23
C08A03		3 5	CA08A03	2	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19		

TABLE 25A

SPS-9A PROJECT 370900, HIGHWAY US-1 SOUTHBOUND, SANFORD, NC

Laboratory Tracking Table for AC Cores (Mixes Other than Superpave)

Laboratory: Agency - at Interval A

Page 1/2

Sample	Constr.	Offset	Sample	Lab	Laboratory Handling & Testing Sequencing								
Loc. No.	Sta.	Ft.	No.	Test No.	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth
C01A60	98+40	3 5	CA01A60	1	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19	Blend	T49
C02A60	98+35	2 0	CA02A60	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Recovered	AE02/P22
C03A60	98+30	3 5	CA03A60	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21			:	Asphalt	AE05/P25
C04A60	98+25	20	CA04A60	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				for	TP5
C05A60	91+05	20	CA05A60	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21	į			Bınder	TP1
C06A60	91+00	3 5	CA06A60	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Testing	TP3
C07A60	90+95	20	CA07A60	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21					AE03/P23
C08A60	90+90	3 5	CA08A60	2	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19		
C01A61	84+40	3 5	CA01A61	1	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19	Blend	T49
C02A61	84+35	20	CA02A61	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Recovered	AE02/P22
C03A61	84+30	3 5	CA03A61	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Asphalt	AE05/P25
C04A61	84+25	20	CA04A61	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				for	TP5
C05A61	77+05	20	CA05A61	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Bınder	TP1
C06A61	77+00	3 5	CA06A61	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Testing	TP3
C07A61	76+95	20	CA07A61	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21					AE03/P23
C08A61	76+90	3 5	CA08A61	2	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19		
C01A62	70+40	3 5	CA01A62	l	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19	Blend	T49
C02A62	70+35	20	CA02A62	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Recovered	AE02/P22
C03A62	70+30	3 5	CA03A62	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Asphalt	AE05/P25
C04A62	70+25	20	CA04A62	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				for	TP5
C05A62	63+05	20	CA05A62	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Bınder	TPI
C06A62	63+00	3 5	CA06A62	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Testing	TP3
C07A62	62+95	2 0	CA07A62	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21					AE03/P23
C08A62	62+90	3 5	CA08A62	2	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19		

TABLE 25A (Cont.)

SPS-9A PROJECT 370900, HIGHWAY US-1 SOUTHBOUND, SANFORD, NC

Laboratory Tracking Table for AC Cores (Mixes Other than Superpave)

Laboratory: Agency - at Interval A

Page 2/2

Sample	Constr.	Offset	Sample	Lab	Laboratory	Handling &	Testing Sequ	iencing					
Loc. No.	Sta.	Ft.	No.	Test No.	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth
C01A63	56+40	3 5	CA01A63	1	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19	Blend	T49
C02A63	56+35	20	CA02A63	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Recovered	AE02/P22
C03A63	56+30	3 5	CA03A63	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Asphalt	AE05/P25
C04A63	56+25	20	CA04A63	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21		•		for	TP5
C05A63	49+05	20	CA05A63	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Bınder	TP1
C06A63	49+00	3 5	CA06A63	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21		ĺ		Testing	TP3
C07A63	48+95	2 0	CA07A63	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21			1		AE03/P23
C08A63	48+90	3 5	CA08A63	2	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19]	
C01A64	42+40	3 5	CA01A64	1	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19	Blend	T49
C02A64	42+35	2 0	CA02A64	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Recovered	AE02/P22
C03A64	42+30	3 5	CA03A64	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Asphalt	AE05/P25
C04A64	42+25	2 0	CA04A64	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				for	TP5
C05A64	35+05	2 0	CA05A64	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Bınder	TP1
C06A64	35+00	3 5	CA06A64	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Testing	TP3
C07A64	34+95	2 0	CA07A64	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21	ļ	1	1		AE03/P23
C08A64	34+90	3 5	CA08A64	2	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19		
C01A65	28+40	3 5	CA01A65	1	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19	Blend	T49
C02A65	28+35	20	CA02A65	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Recovered	AE02/P22
C03A65	28+30	3 5	CA03A65	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Asphalt	AE05/P25
C04A65	28+25	2 0	CA04A65	l i	AC01/P01	AC02/P02	AC04/P04	AE01/P21	1			for	TP5
C05A65	21+05	2 0	CA05A65	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Bınder	TP1
C06A65	21+00	3 5	CA06A65	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Testing	TP3
C07A65	20+95	20	CA07A65	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21					AE03/P23
C08A65	20+90	3 5	CA08A65	2	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19		

TABLE 26 SPS-9A PROJECT 370900, HIGHWAY US-2 NORTHBOUND, SANFORD, NC

Laboratory Tracking Table for AC Cores (Superpave)
Laboratory: Agency - at Interval A

Sample	Constr.	Offset	Sample	Lab	Laboratory	Handling & T	Testing Seque	ncing					
Location	Sta.	Ft.	No.	Test	First	Second	Third	Fourth	Fıfth	Sixth	Seventh	Eighth	Ninth
Number				No.									
C02A02		2 0	CA02A02	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Blend	T49
C06A02		20	CA06A02	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21	}			Recovered	AE02/P22
C15A02		7 8	CA15A02	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Asphalt	AE05/P25
C19A02		7 8	CA19A02	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				for	TP5
C28A02		78	CA28A02	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Bınder	TPI
C33A02		7 8	CA33A02	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Testing	TP3
C11A02		78	CA11A02	1	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19		AE03/P23
C24A02		7 8	CA24A02	2	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19		
C05A02		3 5	CA05A02*	2	AC01/P01								
C25A02		7 8	CA25A02*	2	AC01/P01								

^{*} Spare

TABLE 27
SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC
Laboratory Tracking Table for AC Cores at Intervals t (B through F)
Laboratory: Agency

Sample	Constr.	Offset	Sample	Lab	Laboratory l	Handling & Te	esting Sequenc	ing					
Location No.	Sta.	Ft.	No.	Test No.	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth
C01tXX	Varies	3 5	CA01tXX	1	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19	Blend	T49
C02tXX	with	20	CA02tXX	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Recovered	AE02/P22
C03tXX	t=B	3 5	CA03tXX	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Asphalt	AE05/P25
C04tXX	С	2 0	CA04tXX	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21				for	TP5
C05tXX	D	20	CA05tXX	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Bınder	TPI
C06tXX	Е	3 5	CA06tXX	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Testing	TP3
C07tXX	F	2 0	CA07tXX	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21					AE03/P23
C08tXX		3 5	CA08tXX	2	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19		<u> </u>
Monitorin	ig Stations,	, Ft.											
<u>@ t=</u>	<u>B</u>	<u>C</u>	D	<u>E</u>	E								
C01	-165	-140	-115	-85	-60								
C02	-160	-135	-110	-80	-55								

<u>@ t=</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	E
C01	-165	-140	-115	-85	-60
C02	-160	-135	-110	-80	-55
C03	-155	-130	-105	-75	-50
C04	-150	-125	-100	-70	-45
C05	70	100	125	150	170
C06	75	105	130	155	180
C07	80	110	135	160	185

140

165

190

Note: XX - Test Section Numbers 01, 02, and 03

115

C08

85

FHWA-LTPP-NARO

TABLE 27A SPS-9A PROJECT 370900, HIGHWAY US-1 SOUTHBOUND, SANFORD, NC Laboratory Tracking Table for AC Cores at Intervals t (B through F) Laboratory: Agency

Sample	Constr.	Offset	Sample	Lab	Laboratory I	Handling & Te	sting Sequence	ing					<u>,</u>
Location	Sta.	Ft.	No.	Test	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth
No.				No.									<u> </u>
C01tXX	Varies	3 5	CA01tXX	1	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19	Blend	T49
C02tXX	with	2 0	CA02tXX	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21					AE02/P22
C03tXX	t=B	3 5	CA03tXX	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21			İ	· -	AE05/P25
C04tXX	C	20	CA04tXX	1	AC01/P01	AC02/P02	AC04/P04	AE01/P21			ł	for	TP5
C05tXX	D	20	CA05tXX	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Bınder	TP1
C06tXX	E	3 5	CA06tXX	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21				Testing	TP3
C07tXX	F	2 0	CA07tXX	2	AC01/P01	AC02/P02	AC04/P04	AE01/P21					AE03/P23
C08tXX		3 5	CA08tXX	2	AC01/P01	AC02/P02	AC03/P03	AC04/P04	AE01/P21	AG04/P14	PP19		
<u>@ t=</u>	<u>B</u>	<u>C</u>	<u>D</u>	E	E								
C01	-165	-140	-115	-85	-60								
C02	-160	-135	-110	-80	-55								
C03	-155	-130	-105	-75	-50								
C04	-150	-125	-100	-70	-45								
C05	70	100	125	150	170								
C06	75	105	130	155	180								
C07	80	110	135	160	185								
C08	85	115	140	165	190								
C00	05	115		.02	•,,,								
Note:	XX - Test	Section N	lumbers 61, 62	63 64	and 65								
11016.	7171 1030	Section 1		, 55, 51									

TABLE 28

SPS-9A PROJECT 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC

Summary of Gyratory Compaction Specimen ID's

Other than Superpave Mixes

			Agency Laboratory		SRTC	LCL
				Gyratory Con	npacted Specimen ID	
Material	Project	Laboratory Mixes	QC/QA, Volumetrics	For Moisture	For Performance Testing	For Mix
Description	Designation	and Paver Samples	@ N _{Max}	Susceptibility @ 7% AV	@ 7% AV and 3% AV	Characterization @ 7% AV
AC Surface Course	DHS 12 5 mm Max	NA01AXX-NA09AXX BA01AXX-BA06AXX	LA01AXX-LA03AXX DA01AXX-DA06AXX	LA04AXX-LA09AXX	Note: XX Represents Test Secti 01and 03	on Numbers
SUPERPAVI	E MIXES - TES	T SECTION 02				
AC Bınder Course	HDB 19mm Max	B50A02 (MRL)				
AC Base Course	HB 37 5mm Max	B70A02 (MRL)				
AC Surface Course	HDS 12 5 mm Max	NA01A02-NA40A02 BA01A02-BA34A02	DA02A02-DA04A02 DA31A02-DA33A02	LA09A02-LA14A02	LA07A02-LA08A02 (3% AV) LA23A02-LA40A02 (7% AV) DA01A02, DA34A02 (3% AV) DA06A02-DA08A02 (7% AV) DA10A02-DA14A02 (7% AV) DA19A02-DA28A02 (7% AV)	DA05A02, DA09A02 DA15A02-DA18A02 DA29A02-DA30A02

SRTC - SUPERPAVE REGIONAL TEST CENTER, LCL - LTPP CONTRACTOR LABORATORY, MRL - MATERIALS REFERENCE LIBRARY Note: For SRTC Substitute MRL

FHWA-LTPP-NARO Revised 6/20/97

TABLE 28A SPS-9A PROJECT 370900, HIGHWAY US-1 SOUTHBOUND, SANFORD, NC Summary of Gyratory Compaction Specimen ID's

Material	Project	Laboratory Mixes	Gyratory Compacted Specimen Identification							
Description	Designation	and Paver Samples	For QC/QA @ N _{Max}	For Level 1 Volumetrics @ N _{Max}	For Moist-Suscept. @ 7% Air Voids					
		XX Represents Test Section Numbers 60, 61, 62, 63, 64 and 65								
AC Wearing Course	HDS 12 5 mm Max	NA01AXX - NA09AXX B01AXX-B06AXX	DA01AXX - DA06AXX	LA01AXX-LA03AXX	LA04AXX - LA09AXX					

 $N_{Init} = 8$, $N_{Design} = 96$, $N_{Max} = 152$, For US-1 SB, Moncure, NC

TABLE 29 SPS-9A PROJECT 370900, HIGHWAY US-1, SANFORD, NC Bulk Material Samples for LTPP Materials Reference Library

Materials	Containers	Number of	Sample
Description		Samples	Location
Northbound Asphalt Cement	1-19 litre metal pail per sample	3	Asphalt Plant
Surface Course Combined Coarse and Fine Aggregate	10-19 litre pails per sample	2	Asphalt Plant
AC Base Course (HMAC)	6-12"x12"x6" boxes	1	Road
AC Binder Course (HMAC)	6-12"x12"x6" boxes	1	Road
<u>Southbound</u> Asphalt Cement	1-19 litre metal pail per sample	6	Asphalt Plant
Surface Course Combined Course and Fine Aggregate	10-19 litre pails per sample	2	Asphalt Plant

TABLE 30 SPS-9A PROJECT 370900, HIGHWAY US-1, SANFORD, NC Sampling, Field Testing and Construction Dates

Activity	N	orthbound				South	bound		
				Т	est Sections	5			
	01	02	03	60	61	62	63	64	65
Pre-Paying									
Shoulder Probe	5/12/97	5/12/97	5/12/97	8/13/98	8/13/98	8/13/98	8/13/98	8/13/98	8/13/98
Existing Pavement						:			
12" Cores				8/12/98	8/12/98	8/12/98	8/12/98	8/12/98	8/12/98
5 Pt Levels									
Density				8/20/98	8/20/98	8/20/98	8/20/98	8/20/98	8/20/98
Subgrade									
Density & Moist. (N)		5/12/97					i		
Bulk Samples	5/6/97	5/7/97	5/6/97	8/12/98	8/12/98	8/12/98	8/12/98	8/12/98	8/12/98
Subbase									
Density & Moist. (N)	5/12/97	5/13/97	5/12/97						
Density & Moist. (C)	5/13/97		5/13/97						
Bulk Samples	5/6/97	5/7/97	5/6/97						
5 Pt. Levels	4/21/97	4/21/97	4/21/97			:			
During									
Base									
Laid	5/16/97	5/14/97	7/10/97		:	·			
Density	5/16/97	5/14/97	7/10/97						
5 Pt Levels	7/19/97	5/15/97	7/11/97						
Binder									
Laid	5/22/97	5/20/97	7/11/97						
Density	5/22/97	5/20/97	7/11/97						
5 Pt Levels	5/23/97	5/21/97	7/11/97						ļ
Surface									
Laid	5/29/97	5/28/97	7/12/97	9/12/98	9/16/98	9/17/98	9/18/98	9/23/98	9/26/98
						9/18/98	9/21/98	9/24/98	
Density	5/29/97	5/28/97	7/12/97	9/16/98	9/16/98	9/19/98	9/25/98	9/23/98	10/5/98
5 Pt Levels	5/30/97	5/30/97	7/12/97	10/8/98	10/8/98	10/7/98	10/7/98	10/2/98	10/2/98
Post Const. Cores	1								
t=0	7/29/97	7/30/97	7/29/97	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98
t=6	3/12/98	3/12/98	3/12/98						
t=12	7/16/98	7/16/98	7/16/98						

N - Nuclear

C - Conventional

TABLE 31 SPS-9A PROJECT 370900, HIGHWAY US-1, SANFORD, NC Bulk Subgrade and Subbase (Lime Treated Subgrade) Samples

Test	Date of	Sample	Statio	n #	O/S	Depth Below	Sample	Remarks
Section	Sample	Location	Const.	SHRP		Final Grade	No.	
N T 41.1						j		
Northbound	-15/0-	500101	52 - 50	0.60	<i>-</i> 1	16"	BS01A01	Untrooted Layor 1
370901	5/6/97	B90A01	52+50	0-50	5'	1 1		Untreated Layer 1
	5/6/97	B90A01	52+50	0-50	5'	9"	BS01A01	Lime Treated Layer 2
370902	5/7/97	B90A02	91+00	0-50	5'	16"	BS01A02	Layer 1
	5/7/97	B90A02	91+00	0-50	5'	9"	BS01A02	Layer 2
370903	5/6/97	B90A03	30+50	0-300	5'	16"	BS01A03	Layer 1
	5/6/97	B90A03	30+50	0-300	5'	9"	BS01A03	Layer 2
Southbound								
370960	8/12/98	B01A60	96+25	0-25	3'	17.5"*	BS01A60	
	8/12/98	B01A60	91+75	5+25	3'	18"*	BS02A60	
370961	8/12/98	B01A61	82+25	0-25	3'	20"*	BS01A61	
	8/12/98	B01A61	77+75	5+25	3'	18"*	BS02A61	
370962	8/12/98	B01A62	68+25	0-30	3'	19"*	BS01A62	
	8/12/98	B01A62	63+75	5+25	4.5'	17.5"*	BS01A62	
370963	8/12/98	B01A63	54+25	0-25	3'	19"*	BS01A63	
	8/12/98	B01A63	49+75	5+25	3.5'	17.5"*	BS02A63	
370964	8/12/98	B01A64	40+25	0-25	3'	19"*	BS01A64	
	8/12/98	B01A64	35+75	5+25	3.5'	18.5"*	BS02A64	
370965	8/12/98	B01A65	26+25	0-25	3'	18"*	BS01A65	
	8/12/98	B01A65	21+75	5+25	3'	18"*	BS02A65	

^{*} Depth below top of existing pavement prior to 2.5" overlay.

Note: Although not shown, a moisture sample accompanied each bulk sample.

TABLE 32
SPS-9A PROJECT, 370900, HIGHWAY US-1 NORTHBOUND, SANFORD, NC
Nuclear and Conventional Density and Moisture Tests - Subgrade and Subbase

Test	Test	Test			Subgrade					Subbase		
Section	Date	Location	Nuc	lear	C	Conventional			lear	Conventional		
			Density	Moist.	Density	Moist.	Comp.	Density	Moist.	Density	Moist.	Comp.
			#/Cu. Ft.	%	#/Cu. Ft.	%	%	#/Cu. Ft.	%	#/Cu. Ft.	%	%
370901	5/6/97	0-50	1113	15 7	1147	14 1	100 3	111 5	16 1	111 4	15 8	99 7
3,0,0.	5/12/97	IN TS	711.5					1178	12 7			
	5/13/97	2+50						1170		1152	14 1	101 6
370902	5/6/97	0-50	125 3	11 3	125 0	11 1	101.1	114 4	14 6	112 9	12 8	98 5
	5/12/97	IN TS	114 4	13 8						1143	14 1	101 6
	5/13/97	2+50								1143	14 1	1016
370903*	5/6/97 5/12/97	0-300 IN TS	115 3	18 1	1184	15 8	101 1	113 7 117 3	162 129	109 4	16.2	95 3
	5/13/97	0+00 (30+50)			:					1143	13 6	101 5

^{*} Test Section was later moved to 33+50 - 38+50

Notes: 1 All Density Tests were taken after the Tack Coat was placed on 7" of Subbase (Lime Treated Subgrade)

2 Pits excavated for Conventional Density and Moisture Tests were backfilled with Hot Mix

TABLE 33 SPS-9A PROJECT 370900, HIGHWAY US-1, SANFORD, NC Liquid Asphalt Suppliers

Test Section	Grade AC	Supplier and Source
Northbound 370901	AC20	CITGO, Wilmington, NC
370902	PG 64-22	CITGO, Wilmington, NC
370903	PG 70-22	Koch, Savannah, GA
<u>Southbound</u> 370960	Multigrade PG 76-22	Suitkote, Courtland, NY
370961	PG 64-22	CITGO, Wilmington, NC
370962	SBR MOD 76-22 SBR (in Drums)	CITGO, Wilmington, NC RUB-R-ROAD, Kent, OH
370963	AC-20	CITGO, Wilmington, NC
370964	SBS MOD PG 76-22	Koch, Savannah, GA
370965	PG 70-22	CITGO, Hopewell, VA

TABLE 34
SPS-9A PROJECT 370900, HIGHWAY US-1, SANFORD, NC
Summary of NC DOT Standard Mix Designs 370901 and 370963
(Percent Passing each Sieve Size)

Sieve			Test Sec	tion 370901			Test Sec	tion 370963
Size	Ba	se HB	Bind	ler HDB	Surf	ace HDS	Surf	ace HDS
in.	Spec.	JMF	Spec.	JMF	Spec.	JMF	Spec.	JMF
	Range	НВ	Range	HDB	Range		Range	
2	100	100	!					
1-1/2	95-100	95	-				_	
1			100	100			-	1
3/4	68-82	77	90-100	95	100	100	100	100
1/2			67-78	78	98-100	98	98-100	98
3/8					90-100	95	90-100	95
#4	32-48	43			57-78	65	57-78	65
#8	26-44	35	25-45	34	38-62	50	38-62	50
#16	20-32	25	18-34	25	27-48	37	27-48	37
#40		12	11-23	11	14-35	16	14-35	16
#80					7-15	10	7-15	10
#200	3-5	4 3	3-5	4 0	4-6	5.8	4-6	5.8
Hot Mix		i						
AC %		4 2		4 3		5 0		
Air Voids %		5 0		5 0		5 0		5.0
VMA %		15 8		164		152		15.2
VFA %		70		70 1		70		70
SG Max		2 562		2 576		2 454		2 454
Lab SG		2 434		2 447		2 331		2 331
Flow (0 01 in)		16		12		10		10
Stability (lbs)		3650		1650		3000		3000
Mıx Temp		300		300		300		300
AC Grade		AC20		AC20		AC20		AC20
JMF No		96-092-052		96-081-053		97-292-022		97-292-022

FHWA-LTPP-NARO TABLE 35

SPS-9A PROJECT 370900, HIGHWAY US-1, SANFORD, NC Summary of 37.5 Base and 19.0 Binder Course Superpave Mix Designs

(Percent Passing each Sieve Size)

Sieve		Base 37.5	mm		Binder 19.0mm						
Sizes	Specifica	ition	Test Se	ections	Specifica	tion	Test Se	ections			
mm	Control Pts. & Recommeded Restricted Zone (R)	Tolerance Limits from JMF	JMF 02	JMF 03	Control Pts. & Recommeded Restricted Zone (R)	Tolerance Limits from JMF	JMF 02	JMF 03			
37 5	90-100		100	100							
25 0			89	89							
19 0			68	68	90-100		99	99			
12 5			46	46			80	80			
9 5			39	38			62	62			
4 75	34 7 R		27	27			35	35			
2 36	15 0-41 0		20	20	23 0-49.0		27	27			
2 36 R	23 3-27 3 R				34 6 R						
1 18	15 5-21 5 R		15	15	22.3-28.3 R		21	21			
0 600	11 7-15 7 R		11	11	16 7-20 7 R		16	16			
0 300			8	8			9	8			
0 150			6	6			6	6			
0 075	0 0-6 0		4.2	4 2	2 0-8 0		4 2	4 2			
Hot Mix											
AC %		+/- 0 5	4.5	4.5		+/- 0 5	47	47			
Air Voids %		+/- 1 5	4 0			+/- 1 5	4 0				
VMA %			142				14.0				
VFA %			70			<u> </u>	70				
SG Max			2 487			<u> </u>	2 483				
SG Bulk Nd			2 388				2 384				
Mix Temp			300				300				
AC Grade			PG 64-22				PG 64-22				
JMF No			97-442-021	97-497-021			97-441-021	97-492-02			

TABLE 36
SPS-9A PROJECT 370900, HIGHWAY US-1, SANFORD, NC
Summary of 12.5 mm Superpave Surface Course Mix Designs
(Percent Passing each Sieve Size)

Sieve	Speficicat	ion				Test Section	s JMF		
Size	Control Pts.	Tolerance	02	03	60	61	62	64	65
mm	& Recommended	Limits			,				
	Rest'd. Zone (R)	from JMF							
10	100		100	100	100	100	100	100	100
19 12 5	90 0-100 0	·	94	94	94	94	94	94	94
95	90 0-100 0		84	84	84	84	84	84	84
			43	43	43	43	43	43	43
4 75	20.0.50.0		29	29	28	29	28	28	29
2 36	28 0-58 0		29	29	28	29	28	28	29
2 36 R	39 1 R		L		28	29	28	28	23
1 18	25 6-31 6 R		23	23	1				17
0 600	19 1-23 1 R		17	17	14	17	14	14	
0 300	15 5 R		9	9	8	9	8	8	9
0 150			7	7	6	7	6	6	7
0 075	2 0-10 0		4 4	44	41	4 4	4 1	4 1	4 4
Hot Mix									
AC %			5 2	5 1	5 8	5 2	5 8	5 8	5 1
Air Voids %			4 0	40	5 0	14 0	40	4.0	4 0
VMA %			14 8	148	160	14 8	16.3	163	14 8
VFA %			73	72	0.0	73	75.0	75 0	72
SG Max (Rice)			2 464	2 468	2 447	2 464	2 436	2 436	2 468
SG Bulk Nd			2 356	2 369	2 349	2 365	2 388	2 388	2 369
Mix Temp			300	315	300	300	300	300	315
AC Grade		<u> </u>	PG 64-22	PG 70-22	PG 76-22	PG 64-22	SBR PG 76-22	SBR PG 76-22	PG 70-22
JMF No			97-440-021	97-493-021	98-481-071	97-442-021	98-468-021	98-469-021	97-493-021

TABLE 37A
SPS-9A PROJECT 370900, HIGHWAY US-1, SOUTHBOUND, SANFORD, NC
Chronology of Mix Verifications and Paving Operations

Date	Description of Work
Weds., Sept. 9	Contractor was not ready.
Thurs., Sept. 10	AC arrived 9:30am instead of 3.00am at 200 deg.
	Heated to 300 deg. First verification was completed at
	11:00pm. Failed, Voids too low
Fri., Sept. 11	Second verification ended 10:00am. Faied, Voids too low.
	Third verification ended at 5:00pm. Passed.
Sat., Sept 12	370960 Both lifts in both lanes completed
Mon., Sept 14	370961 Verification completed 10:00am. Plant down
Tues., Sept 15	370961 Laid first lift of inside lane. Plant down.
Weds., Sept 16	370961 Completed remaining lifts. Verified 370962.
Thurs., Sept. 17	370962 Filled silo for other work and completed first lift of both lanes.
Fri., Sept. 18	370962 Placed second lift of both lanes.
	370963 Placed first lift of both lanes.
Mon , Sept. 21	370963 Placed second lift of both lanes.
Tues. Sept 22	370964 AC arrive at 8 00am instead of 6 00am Cold at 250 deg. Took
	until 1 00pm to heat to 300 deg. Tried 2 verifications Both
	failed Low voids.
Weds., Sept 23	370964 Two more verifications Fourth passed. Paved first lift of
	drıvıng lane.
Thurs, Sept 24	370964 AC burner failed during night Reheated AC and placed the
	three lanes
Fri, Sept 25	370965 AC arrived late at 8 00am instead of 6 00am and cold requiring
	heating until 1 30pm Verification approved at 4 30pm Placed
	one inside lane.
Sat, Sept 26	370965 Place the remaining three lanes thus completing the paving
	of test sections

TABLE 38
SPS-9A PROJECT 370900, HIGHWAY US-1, SANFORD, NC
Summary of Bituminous Paving Construction Data

Test	Paving	Layer	Plant	Haul	#	HM Ten	p Deg. F	Time to	Air Temp.	Remarks
Section	Date		Location	Distance		Trucks	Laydown	Pave TS	Weather	
				Mi.		Temp.		Min.	Deg. F	
Northbound	5/16/97	Base	Sanford	11	9	290		35	78	Pave North to South (NS)
370901	5/22/97	Bınder	Moncure		8	289		57	77	NS
[5/29/98	Surface	Moncure		6	307		32	85	NS
370902	5/14/97	Base	Sanford	12	8	266		55	80	SN
	5/20/97	Bınder	Sanford	12	7	303		55	92	NS Hopper overspill 4+50
	5/28/97	Surface	Sanford	12	6	287		43	73	NS
370903	7/10/97	Base	Sanford	11	9	302		63	84	SN
	7/11/97	Binder	Sanford	11	7	327		42	89	NS
	7/12/97	Surface	Sanford	11	8	324		48	87	Hopper overspill 0-150 NS
Southbound										
370960	9/12/98	1st Surface	Sanford	12	4	335	-	20	85 sunny	
	9/12/98	2nd Surface	Sanford		5	348	320	15	90 sunny	Hopper overspill 1+00
370961	9/16/98	1st Surface	Sanford	12	4	312	305	25	81 sunny	
	9/16/98	2nd Surface	Sanford		4	308	293	15	91 sunny	
370962	9/17/98	1st Surface	Sanford	12	5	332	342	29	88 sunny	
	9/18/98	2nd Surface	Sanford		5	339	-	21	75 hazy	
370963	9/18/98	1st Surface	Sanford	11	6	301	286	22	87 cloudy	Hopper overspill 5+40
	9/21/98	2nd Surface	Sanford		8	308	290	21	71 cloudy	
370964	9/23/98	1st Surface	Sanford	11	6	345	324	19	73 sunny	
	9/24/98	2nd Surface	Sanford		7	350	331	30	73 sunny	Stopped 30 min 5+00
370965	9/26/98	1st Surface	Sanford	11	7	337	300	31	70 sunny	
	9/26/98	2nd Surface	Sanford		8	359	348	15	84 sunny	Stopped 15 min 0-100

FHWA-LTPP-NARO

TABLE 20

TABLE 39
SPS-9A PROJECT 370900, HIGHWAY US-1, SANFORD, NC
Bituminous Base, Binder and Surface Course Compaction Test Results - NBL

Test		Ba	ise			Bin	der			Sur	face	
Section	Test	Density	Target	Comp.	Test	Density	Target	Comp.	Test	Density	Target	Comp.
	Date	#/Cu. Ft.	#/Cu. Ft.	%	Date	#/Cu. Ft.	#/Cu. Ft.	%	Date	#/Cu. Ft.	# / Cu. Ft.	%
Northbound		•				l					1	
370901	5/16/97	138 9	149 6	92 8	5/22/97	144 8	153 5	95.6	5/29/97	145 3	148 1	97 9
									5/00/05		1.47.0	04.7
370902	5/14/97	1166	136 2	85 6	5/20/97	133 3	146 4	91 1	5/28/97	146 0	147 8	94 7
	-460-	105 (00.2	2/11/02	1,27,4	140.0	02.0	7/12/07	1220	145.4	01.4
370903	7/10/97	127 6	1417	90 2	7/11/97	137 4	148 0	92 8	7/12/97	132 9	145 4	91 4
		1]		l]	

TABLE 39A SPS-9A PROJECT 370900, HIGHWAY US-1, SANFORD, NC Pavement Densities and Overlay Compaction Test Results - SBL

Test	Existing Pavement		Overlay										
Section	Density (4") # / Cu. Ft. *	Date Laid 1st Lift	2nd Lift	Test Date	Avg. Density #/Cu. Ft.	Target Density	Comp. %	AC					
370960	139 0	9/9/98	9/9/98	9/9/98	129 2	152 2	84	PG 76-22					
370961	138 0	9/16/98	9/16/98	9/16/98	131 0	152 8	86	PG 64-22					
370962	135 0	9/17/98	9/18/98	9/19/98	135 7	152 6	90	SBR Mod PG 76-22					
370963	138 7	9/18/98	9/21/98	9/25/98	145 8	146 5	100	AC-20					
370964	132 5	9/23/98	9/24/98	9/25/98	136 8	153 7	89	SBS Mod PG 76-22					
370965	137 2	9/26/98	9/26/98	10/10/98	133 8	153 5	87	PG-22					

^{*} All the Densities were obtained on 8/12/98

TABLE 40 SPS-9A PROJECT 370900, HIGHWAY US-1, SANFORD, NC Bituminous Base, Binder and Surface Course Thicknesses 5 Point Levels

Test			Base Cour	se In					Binder Cou	rse In.					Surface Cou	rse In.		
Section .	Design	Nom	Avg. Completed	Min	Max	St Dev	Design	Nom	Avg. Completed	Min	Max.	St. Den.	Design	Nom.	Avg. Completed	Min.	Max	St Den.
Northbound 370901 370902	35	4 2 4 2	3 4	3 () 2 8	40	0.3	3 () 3 ()	3 5 3 5	28	20	36	04	2 5 2 5	30	2 6 2 7	23	2 9 3 1	01
370903	3.5	4 2	3.4	29	29	0.3	3 ()	3.5	2 9	2 5	3 4	0.2	2 5	3 0	2 4	2 0	29	0 2
Southbound 370960 370961 370962 370963 370964 370965													25 25 25 25 25 25	2x1 5 2x1 5 2x1 5 2x1 5 2x1 5 2x1 5	20 24 25 23 27 26	14 19 19 19 22 20	28 30 31 28 35 34	0 3 0 3 0 3 0 2 0 3

TABLE 41
SPS-9A PROJECT 370900, HIGHWAY US-1, NB SANFORD, NC
Comparison of Surface and Binder Course Thicknesses

Test Section	Thickness of Binder and Surface	Design Thickness Binder & Surface	Diff. From Design	Avg. Thickness Other Test Sections Binder & Surface	Diff. From Avg. of Other Test Sections
Northbound					
New Construction				(02, 03)	
370901	5 41 m	5 50 m	- 0 09 m	5 33 in	+ 0 8 m
	137 mm	140 mm	- 3 mm	136 mm	+ 1 mm
				(01, 03)	
370902	5 27 m	5 50 m	- 0 23 m	5 40 in	- 0 13 m
	134 mm	140 mm	- 6 mm	137 mm	- 3 mm
				(01, 02)	
370903	5 39 m	5 50 m	- 0 11 m	5 34 in	+ 0 05 in
	137 mm	140 mm	- 3 mm	136 mm	+ 1 mm
	12, IIII				

The Guidelines show that the Compacted Thickness of the Asphalt Concrete (Surface plus Binder Course) in any test section shall be constructed to within +/- 6mm of the average value of the other test section in the project

TABLE 42A
SPS-9A PROJECT 370900, HIGHWAY US-1, SB SANFORD, NC
Comparison of Surface Course Thickness

Test Section	Thickness of Surface Course mm (in.)	Design Thickness Surface Course mm (in.)	Diff. From Design mm	Avg. Thickness Other Test Sections Surface Course mm	Diff. From Avg. of Other Test Sections mm
	Southbound Overlay Construction				
370960	52 (2 03)	64 (2 50)	-12	64	-12
370961	62 (2 42)	64 (2 50)	-2	62	0
370962	63 (2 48)	64 (2 50)	-1	62	1
370963	58 (2 30)	64 (2 50)	-6	63	-5
370964	70 (2 74)	64 (2 50)	6	60	10
370965	67 (2 63)	64 (2 50)	3	61	6

TABLE 43
SPS-9A PROJECT 370900, HIGHWAY US-1, NORTHBOUND, SANFORD, NC
Core Thickness Measurements July 29-30, 1997 - t = A (0 mos.)

Test	_		Before To	est Section					After Te	st Section			Total
Section	LTPP	Core		Thick	ness In.		LTPP	Core		Thick	ness In.		Design
	Sta Ft.	#	Base	Bınder	Surface	Total	Sta. Ft.	#	Base	Binder	Surface	Total	Thickness
370901	0-175	CA01A01	3 5	3 0	2 5	90	5+45	CA05A01	41	29	2 5	9 5	Base - 3 5
	0-180	CA02A01	3 5	3 4	2 6	95	5+50	CA06A01	3 7	3 1	25	93	Binder - 30
	0-185	CA03A01	3.4	3.1	2 5	90	5+55	CA07A01	40	3 0	2 5	95	Surface - 2 5
	0-190	CA04A01	3 5	3 3	2 5	93	5+60	CA08A01	3 8	3 0	2.5	93	Total - 90
		Avg	3 45	3 20	2 52	9 20			3 9	3 0	2 50	9 40]
370902	0-190	CA01A02				*	5+45	CA05A02	3 3	3 0	2 5	96	
	0-185	C 102 402	3 0	3 0	2.5	8.5	5+50	CA06A02	3 7	29	2 5	91	ļ
	0-180	C 103A02	3 0	2.8	2.5	73	5+55	CA07A02	3 4	29	2.5	8 8	1
	0-175	CA04A02				*	5+60	CA08A02		•		*	
	0-195	CA09A02	: -			*	5+40	CA22A02				*	
	0-190	C 110A02				*	5+45	CA23A02	3 5	30	2 5	90	
	0-185	CATTA02	3 3	2 8	2 5	86	5+50	CA24A02	3 5	29	26	90	
i	0-180	CA12A02				*	5+55	CA25A02	3 5	29	26	90	
	0-175	CA13A02			1	*	5+60	CA26A02				*	
	0-170	CA14A02	3 3	28	2 5	86	5+65	CA27A02				*	
	0-165	CA15A02	3 0	28	2 8	86	5+70	CA28A02	3 7	29	2 5	91	
	0-160	CA16A02	3 5	2 8	2 5	8.8	5+70	CA29A02				*	
	0-155	CA17A02		ĺ		*	5+80	CA30A02		ľ		*	
	0-150	CA18A02				*	5+85	CA31A02	3 3	3 3	2 5	91	
	0-145	CA19A02	3 0	3 0	2 5	8.5	5+90	CA32A02	3 5	3 0	2.5	90	
	0-140	CA20A02				*	5+95	CA33A02	3 5	29	26	90	
	0-135	CA21A02	3 0	3 0	2 5	8.5	6+00	CA34A02			ļ	*	
1		Avg	3 13	2 87	2 53	8 42	1		3 49	2 87	2 53	9 07	1
370903	0-190	CA01A03	3 0	3 4	2 3	8 7	5+45	CA05A03	3 3	3 0	2 5	8 8]
	0-185	CA02A03	3 0	3 4	2 3	8 7	5+50	CA06A03	3 1	3 1	2 5	8 7	
	0-180	CA03A03	3 0	3 3	2 3	86	5+55	CA07A03	3 3	3 0	2 5	8 8	
	0-175	CA04A04	3 2	3 3	2 3	8 8	5+60	CA08A03	30	3 3	2 5	8 8	
		Avg	3 05	3 35	2 3	8 7	1		3 17	3 10	2 5	8 7	1

Note

- 1 *These 16 cores intended for the Superpave Regional Test Center (SRTC) will be taken at a later date when the testing procedures are finalized
- 2 The Guidelines show that the Layer Thickness of the Binder and Surface Course should not vary more than 10mm (0 4") from Design
- 3 Additional cores, not included above, were taken as follows
- 370902 16 cores for the National Center for Asphalt Technology (NCAT)
- 370903 26 cores 16 cores as a duplicate of 16 cores for SRTC if required and 10 cores for NCAT or for further NC purposes

TABLE 44

SPS-9A PROJECT 370900, HIGHWAY US-1, NORTHBOUND, SANFORD, NC

Core Thickness Measurements March 12, 1998 - t = B (6 mos.)

Test			Before Tes	st Section					After Test	Section			Total
Section	LTPP	Core		Thick	ness In.		LTPP	Core		Thick	ness In.		Design
	Sta. Ft.	#	Base	Binder	Surface	Total	Sta. Ft.	#	Base	Binder	Surface	Total	Thickness
370901	0-165	CA01B01	3 2	3 1	24	8 7	5+70	CA05B01	3 3	2 8	23	8 4	Base - 3 5
	0-160	CA02B01	3 1	3 0	2 4	8 5	5+75	CA05B01	3 3	2.7	24	8 4	Binder - 3 0
	0-155	BA03B01	3 2	30	2 4	86	5+80	CA07B01	3 5	27	24	86	Surface - 2 5
	0-150	CA04B01	3 2	3 0	2 3	8.5	5+85	CA08B01	3 2	28	24	8 4	Total - 90
		Avg	3 17	3 02	2 37	8 57			3 32	2.75	2.37	8 45	
370902	0-165	CA01B02	3.2	3 3	24	8 9	5+70	CA05B02	40	3 2	23	9 5	
	0-160	CA02B02	3 5	3 5	2 3	93	5+75	CA06B02	3 5	3.1	24	9.0	
	0-155	CA03B02	3 0	3 5	2 3	8 8	5+80	CA07B02	39	3.2	23	9 4	
	0-150	CA04B02	3 5	3 4	2 4	99	5+85	CA08B02	3 6	3 1	2 4	91	
		Avg	3.3	3 42	2 35	9 22			3 75	3.15	2.35	9.25	1
370903	0-165	CA01B03	3 2	2 7	2.5	8 4	5+70	CA05B03	3.5	3.0	26	91	
• • • • • • • • • • • • • • • • • • • •	0-160	CA02B03	3.4	2 8	2.4	8 4	5+75	CA06B03	3.5	3.1	2.5	91	
	0-155	CA03B03	3 3	2 8	2 4	8.5	5+80	CA07B03	3.6	3.2	26	94	
	0-150	CA04B03	3 3	28	2.4	8.5	5+85	CA08B03	36	3 0	26	92	
		Avg	3 3	2 78	2 42	8 45			3 55	3.07	2 57	9.20	
	<u> </u>			<u> </u>		<u> </u>							

Note The Guidelines show that the thickness of the Surface Layer (Binder & Surface) should not deviate more than 10mm (0 4") from Design

TABLE 45
SPS-9A PROJECT 370900, HIGHWAY US-1, NORTHBOUND, SANFORD, NC
Core Thickness Measurements July 16, 1998 - t = C (12 mos.)

Test			Before Tes	st Section			After Test Section					Total Design	
Section	LTPP	Core #	Thickness In.			LTPP	Core		Thickness In.				
	Sta. Ft.		Base	Binder	Surface	Total	Sta. Ft.	#	Base	Binder	Surface	Total	Thickness
370901	0-140	CA01C01	3 0	3 5	2 2	8 7	6+00	CA05C01	3 7	3 3	22	9 2	Base - 3 5
	0-135	CA02C01	3 2	3 6	22	90	6+05	CA06C01	3 4	3 3	23	90	Binder - 3 0
	0-130	CA03C01	3 1	3 4	23	8 8	6+10	CA07C01	3 5	3 3	24	92	Surface - 2 5
	0-125	CA04C01	3 6	3 7	2 3	9 5	6+15	CA08C01	3 6	3 2	2.5	9 3	Total - 9.0
		Avg	3 22	3 55	2 22	90			3 55	3.27	2 35	9 17	
370902	0-140	CA01C02	3 3	2 7	2.5	8.5	6+00	CA05C02	3 7	3 0	2 5	93	
370202	0-135	CA02C02	3 2	28	2.5	8.5	6+05	CA06C02	3 5	3 0	26	91	
	0-130	CA03C02	3 3	27	2.5	8.5	6+10	CA07C02	36	3 0	26	9 2	
	0-125	CA04C02	3 3	2 7	2.5	8 5	6+15	CA07C02	3 6	3 0	26	92	
		Avg	3 27	2 72	2 5	8 5			3 6	3.0	2 57	9 2	
370903	0-140	CA01C03	3 3	3 3	2 2	8 8	6+00	CA05C03	3 5	2.8	2.5	8 8	
3,000	0-135	CA02C03	3 2	3 1	23	8 6	6+05	CA06C03	3 4	28	2.5	8 7	
	0-130	CA03C03	3 1	3 3	2 2	8 6	6+10	CA07C03	3 5	28	24	8 8	
	0-125	CA04C03	3 3	3 1	2 3	8 7	6+15	CA07C03	3 4	2 9	2.5	8 8	
		Avg	3 22	3 2	2 25	8 65			3.45	2 82	2 47	8 77	

Note The Guidelines show that the thickness of the Surface Layer (Binder & Surface) should not deviate more than 10mm (0 4") from Design

TABLE 46A
SPS-9A PROJECT 370900, HIGHWAY US-1, SOUTHBOUND, SANFORD, NC
Core Thickness Measurements October 22, 1998 - t = 0 mos.

LTPP Sta. Ft. 0-190 0-185 0-180 0-175	CA01C60 CA02A60	Thicki Overlay	Total	LTPP Sta. Ft.	Core #		iess In.	Design
0-190 0-185 0-180	CA01C60 CA02A60	Overlay	Total	Sta. Ft.	1 44 1			
0-185 0-180	CA02A60				#	Overlay	Total	Thickness
0-185 0-180	CA02A60				G105160		10.55	
0-180			13	5+45	CA05A60		13.75*	
			12	5+50	CA06A60		12.5*	!
0-175	CA03A60		12.75	5+55	CA06A60		13.75	
	CA04A60		12.75	5+60	CA07A60		10.5	
0-190	CA01A61		13 5	5+45	CA05A61		13.5	
0-185	CA02A61		13 25*	5+50	CA06A61		i	
0-180	CA03A61		13.75	5+55	CA07A61		8	
0-175	CA04A61		13.5	5+60	CA08A61		13	
0.100	CA01A62		10.75	E 1 4 5	CAOSACO		12.5	
	1 1			1)		1	
	1				i			
0-175	CA04A62		14 5	5+60	CA08A62		12.25	
0-190	CA01A63		13 5	5+45	CA05A63		13 5	•
0-185	CA02A63		13 25*	5+50	CA06A63		13 5	
0-180	CA03A63		13.5	5+55	CA07A63		13]
0-175	CA04A63		13 25	5+60	CA08A63		13	
0-190	CA01A64		13	5+45	CA05A64		12	
					1			1
	1							
0-175	CA04A64	į	13 5	5+60	CA08A64	:	12	
0.100	CA01A65		12	5145	CA05A65		12.75	
					1 1			
					l .			
					1			1
0-175	CA04A65		6 75**	5+60	CA08A65		12 75	
	0-185 0-180 0-175 0-190 0-185 0-180 0-175 0-180 0-175 0-190 0-185 0-180	0-185	0-185	0-185 CA02A61 13 25* 0-180 CA03A61 13.75 0-175 CA04A61 13.75 0-190 CA01A62 12.75 0-185 CA02A62 13.5 0-180 CA03A62 13.5 0-175 CA04A62 14 5 0-190 CA01A63 13 25* 0-185 CA02A63 13 25* 0-180 CA03A63 13.5 0-175 CA04A63 13 25* 0-190 CA01A64 13 0-185 CA02A64 13 0-180 CA03A64 13 0-175 CA04A64 13 0-180 CA03A65 12 0-185 CA02A65 12 5* 0-180 CA03A65 12*	0-185 CA02A61 13 25* 5+50 0-180 CA03A61 13.75 5+55 0-175 CA04A61 13.75 5+55 0-175 CA04A61 12.75 5+45 0-185 CA02A62 13.5 5+50 0-180 CA03A62 13.5 5+55 0-175 CA04A62 14 5 5+60 0-190 CA01A63 13 25* 5+50 0-185 CA02A63 13.5 5+55 0-180 CA03A63 13.5 5+55 0-175 CA04A63 13 25* 5+60 0-190 CA01A64 13 5+45 0-180 CA03A64 13 5+55 0-175 CA04A64 13 5+55 0-175 CA04A64 13 5+55 0-180 CA03A65 12 5+50 0-185 CA02A65 12 5* 5+50 0-180 CA03A65 12* 5+55	0-185 CA02A61 13 25* 5+50 CA06A61 0-180 CA03A61 13.75 5+55 CA07A61 0-175 CA04A61 13.5 5+60 CA08A61 0-190 CA01A62 12.75 5+45 CA05A62 0-185 CA02A62 13.5 5+50 CA06A62 0-180 CA03A62 13.5 5+55 CA07A62 0-175 CA04A62 14.5 5+60 CA08A62 0-190 CA01A63 13.5 5+45 CA05A63 0-185 CA02A63 13.5 5+55 CA06A63 0-180 CA03A63 13.5 5+55 CA07A63 0-175 CA04A63 13.5 5+55 CA07A63 0-180 CA03A64 13 5+55 CA06A64 0-180 CA03A64 13 5+55 CA07A64 0-180 CA03A64 13 5+55 CA07A64 0-185 CA02A65 12 5+45 CA05A65	0-185 CA02A61 13 25* 5+50 CA06A61 0-180 CA03A61 13.75 5+55 CA07A61 0-175 CA04A61 13.75 5+55 CA07A61 0-175 CA04A61 12.75 5+45 CA05A62 0-185 CA02A62 13.5 5+50 CA06A62 0-180 CA03A62 13.5 5+55 CA07A62 0-175 CA04A62 14.5 5+60 CA08A62 0-190 CA01A63 13.5 5+55 CA05A63 0-185 CA02A63 13.5 5+50 CA06A63 0-180 CA03A63 13.5 5+55 CA07A63 0-175 CA04A63 13.25 5+60 CA08A63 0-190 CA01A64 13 5+45 CA05A64 0-185 CA02A64 13 5+55 CA07A64 0-180 CA03A64 13 5+55 CA07A64 0-185 CA02A65 12.5* 5+50 CA06A65	0-185 CA02A61 13 25* 5+50 CA06A61 13 0-180 CA03A61 13.75 5+55 CA07A61 13 0-175 CA04A61 13.5 5+60 CA08A61 13 0-190 CA01A62 12.75 5+45 CA05A62 12.5 0-185 CA02A62 13.5 5+50 CA06A62 12 0-180 CA03A62 13.5 5+55 CA07A62 12.5 0-175 CA04A62 14.5 5+60 CA08A62 12.25 0-190 CA01A63 13.5 5+45 CA05A63 13.5 0-185 CA02A63 13.25* 5+50 CA06A63 13.5 0-180 CA03A63 13.5 5+55 CA07A63 13 0-190 CA01A64 13 5+45 CA05A64 12 0-185 CA02A64 13 5+55 CA07A64 12* 0-180 CA03A64 13 5+55 CA07A64 12*

Note

- 1 Individual Bituminous Layers were not measured.
- 2 * cores with one separation
- 3 ** partial recovery of core

TABLE 47
SPS-9A PROJECT 370900, HIGHWAY US-1, NORTHBOUND, SANFORD, NC
Comparison of Core Thickness Vs. 5 Point Levels

	Thickness							
Layer	Cores B	efore TS	5 Point	Cores A	Design			
	#	Thickness	Levels	#	Thickness			
Base	12	3 3	3 4	12	3 4	3.5		
Bınder	12	3 3	2.8	12	3 0	3.0		
Surface	12	2 4	2.6	12	2 4	2.5		
Base	16	3 2	3 2	18	3 6	3.5		
Bınder	16	3 0	2.6	18	2.9	3.0		
Surface	16	2.5	2.7	18	2 7	2.5		
Base	12	3 3	3 4	12	3.4	3.5		
Bınder	12	3 1	2 9	12	3 0	3.0		
Surface	12	2 3	2 4	12	2 5	2.5		
	Base Binder Surface Base Binder Surface Base Binder	# Base 12 Binder 12 Surface 12 Base 16 Binder 16 Surface 16 Base 12 Base 12 Binder 12	# Thickness Base 12 3 3 Binder 12 3 3 Surface 12 2 4 Base 16 3 2 Binder 16 3 0 Surface 16 2.5 Base 12 3 3 Binder 12 3 1	Layer Cores Before TS 5 Point Levels Base 12 3 3 3 4 Binder 12 3 3 2.8 Surface 12 2 4 2.6 Base 16 3 2 3 2 Binder 16 3 0 2.6 Surface 16 2.5 2.7 Base 12 3 3 3 4 Binder 12 3 1 2 9	Layer Cores Before TS 5 Point Levels Cores A Base 12 3 3 3 4 12 Binder 12 3 3 2.8 12 Surface 12 2 4 2.6 12 Base 16 3 2 3 2 18 Binder 16 3 0 2.6 18 Surface 16 2.5 2.7 18 Base 12 3 3 3 4 12 Binder 12 3 1 2 9 12	Layer Cores Before TS 5 Point Levels Cores After TS Base 12 3 3 3 4 12 3 4 Binder 12 3 3 2.8 12 3 0 Surface 12 2 4 2.6 12 2 4 Base 16 3 2 3 2 18 3 6 Binder 16 3 0 2.6 18 2.9 Surface 16 2.5 2.7 18 2 7 Base 12 3 3 3 4 12 3.4 Binder 12 3 1 2 9 12 3 0		

Note

The thickness of the Bituminous Layers as determined by the 5 Point Levels within the test sections and the core thicknesses from outside the monitoring section are close





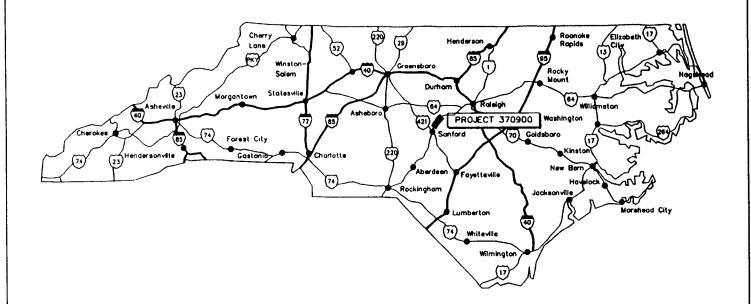


FIGURE 1 - N.C. DOT SPS-9A PROJECT 370900 SANFORD, N.C.

N C. DOT SPS-9A US-1 SANFORD, N.C

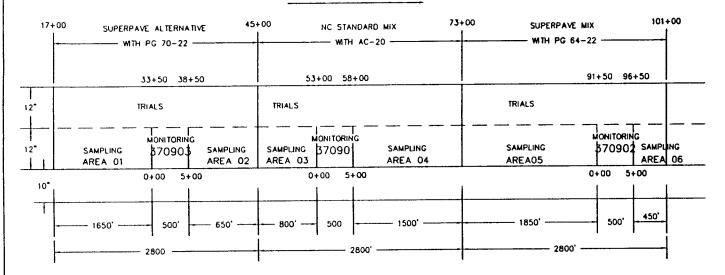
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INA SPS-BA TEST SECTIONS CIRLY COMENSONAL DETAILS COLY CRANNO MOT TO SCALE





DIRECTION OF TRAFFIC US-1 NB



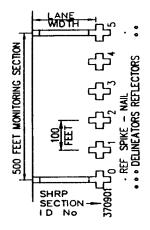
US-1 NORTHBOUND LANE (NEW CONSTRUCTION)

CODE 148
148
170
181
322
01
01

. PLACED IN ONE LIFT

FIGURE 2 - LAYOUT OF SPS-9A NEW CONSTRUCTION TEST SECTIONS US-1 NORTHBOUND, SANFORD, NORTH CAROLINA









LAYOUT OF NEW CONSTRUCTION TEST SECTIONS

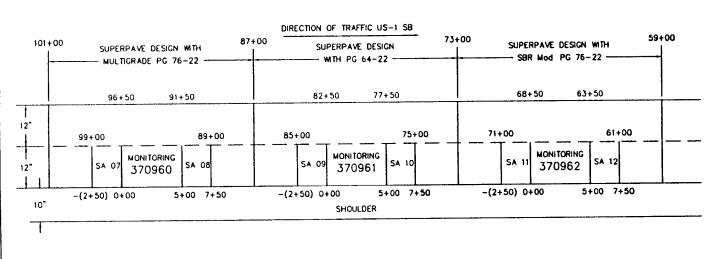
N C DOT SPS-9A US-1 NB SANFORD, N.C.

SPS-9A-02

PHINA SPS-BA TEST SECTIONS ONLY DIMENSIONAL DETAILS ONLY DRAWING NOT TO SCALE







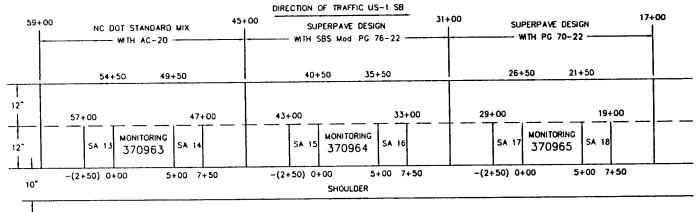
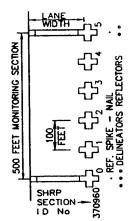


FIGURE 2a - LAYOUT OF SPS-9A OVERLAY TEST SECTIONS US-1 SOUTHBOUND, SANFORD, NORTH CAROLINA

NOTE.
2 1/2" ASPHALT CONCRETE OVERLAY
SA - SAMPLING AREA

STATIONING IN FEET

TYPICAL SITE SIGNING & MARKING







LAYOUT OF OVERLAY TEST SECTIONS

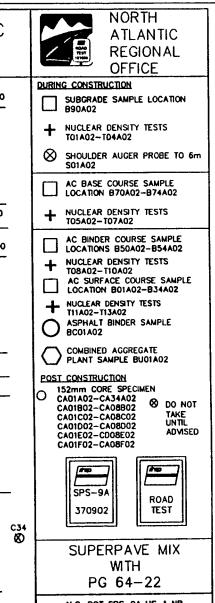
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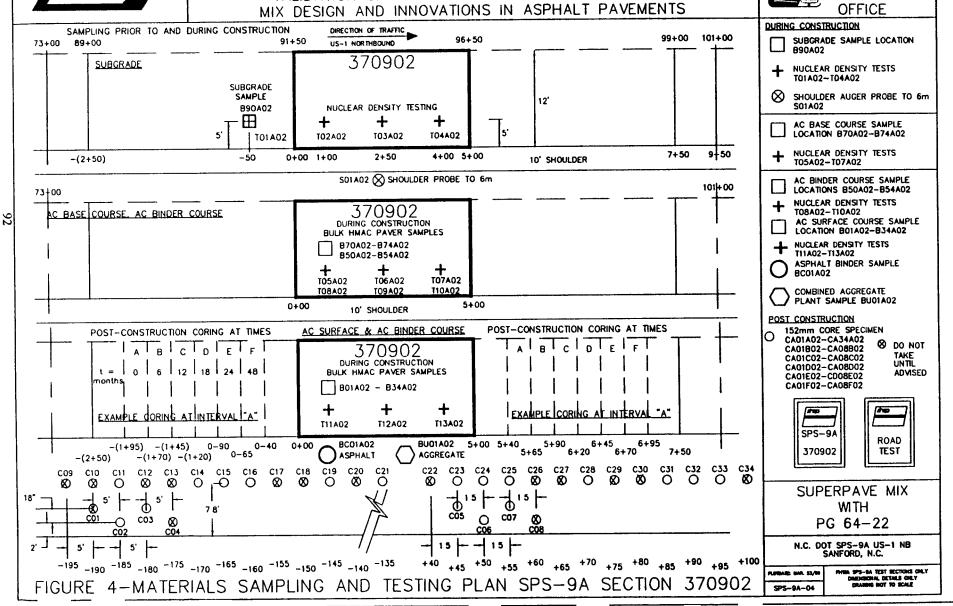
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PHEA SPS-SA TEST SECTIONS ONLY DRAWNING HOT TO SCALE

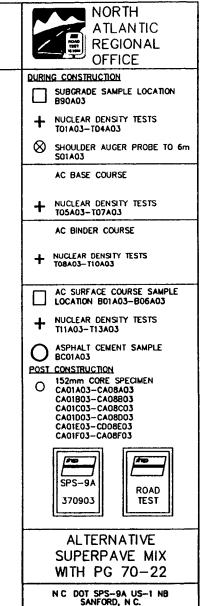
NORTH FHWA-LTPP SPS 9A SANFORD, N.C. DESIGN SCHEMATIC ATLANTIC VALIDATION OF SHRP ASPHALT SPECIFICATIONS AND REGIONAL MIX DESIGN AND INNOVATIONS IN ASPHALT PAVEMENTS **OFFICE** DIRECTION OF TRAFFIC DURING CONSTRUCTION SAMPLING PRIOR TO AND DURING CONSTRUCTION US-1 NORTHBOUND 58+00 60+50 73+00 53+00 SUBGRADE SAMPLE LOCATION 45+00 50+50 890A01 370901 SUBGRADE NUCLEAR DENSITY TESTS T01A01-T04A01 SUBGRADE SAMPLE SHOULDER AUGER PROBE TO 6m 12' B90A01 NUCLEAR DENSITY TESTING S01A01 \blacksquare + + AC BASE COURSE 5 T01A01 T02A01 T03A01 T04A01 NUCLEAR DENSITY TESTS 0+00 1+00 2+50 4+00 5+00 7+50 -50 -(2+50)10' SHOULDER T05A01-T07A01 AC BINDER COURSE SOIAOI (X) SHOULDER PROBE TO 6m 73+00 NUCLEAR DENSITY TESTS TOBACI-TICACI AC SURFACE COURSE SAMPLE 370901 91 AC BASE COURSE, AC BINDER COURSE LOCATION BOTAGE-BOGAGE DURING CONSTRUCTION NUCLEAR DENSITY TESTS T11A01-T13A01 ASPHALT CEMENT SAMPLE + + BC01A01 T07A01 T05A01 T06A01 T08A01 T09A01 COMBINED AGGREGATE PLANT SAMPLE BUOTAOT 5+00 0+00 10' SHOULDER POST CONSTRUCTION POST-CONSTRUCTION CORING AT TIMES POST-CONSTRUCTION CORING AT TIMES AC SURFACE COURSE 152mm CORE SPECIMEN CA01A01-CA08A01 370901 CA01B01-CA08B01 CA01C01-CA08C01 DURING CONSTRUCTION CA01D01-CA08D01 BULK HMAC PAVER SAMPLES CA01E01-CD08E01 months B01A01 - B06A01 CA01F01-CA08F01 + T11A01 T12A01 T13A01 5+65 5+90 SPS-9A 0 6+45 6+95 6+20 6+70 ROAD -(1+95) -(1+45) 0-90 BU01A01 5+00 5+40 0-40 0+00 BC01A01 370901 TEST AGGREGATE) ASPHALT -(2+50)-(1+70) -(1+20) 0-65 EXAMPLE CORING AT INTERVAL "A" EXAMPLE CORING AT INTERVAL "A" NC DOT 152mm CORE SPECIMEN CA01A01 - CA08A01 STANDARD MIX 0 0 0 O C08 CO3 C06 0 WITH AC-20 Č 5 **C07** N.C. DOT SPS-9A US-1 NB -(1+70) 5+40 SANFORD, N.C. FHWA SPS-BA WEST SECTIONS ONLY FIGURE 3-MATERIALS SAMPLING AND TESTING PLAN SPS-9A SECTION 370901

FHWA-LTPP SPS 9A SANFORD, N.C. DESIGN SCHEMATIC VALIDATION OF SHRP ASPHALT SPECIFICATIONS AND

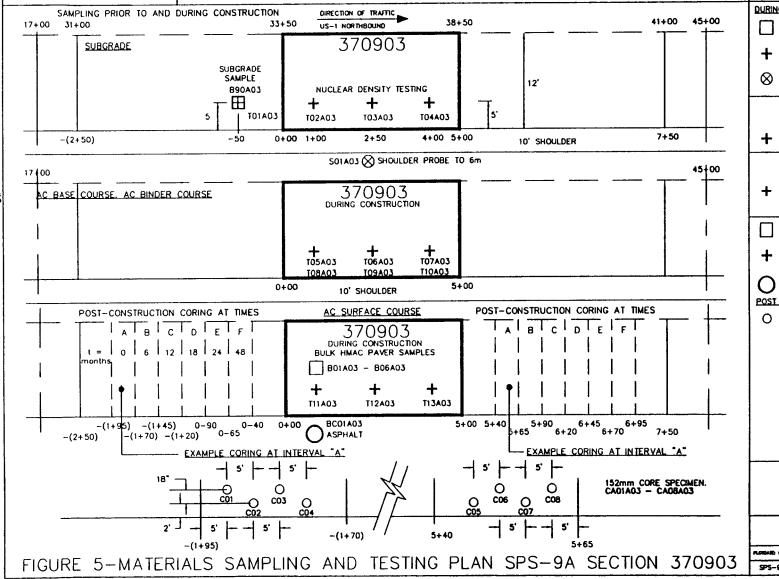




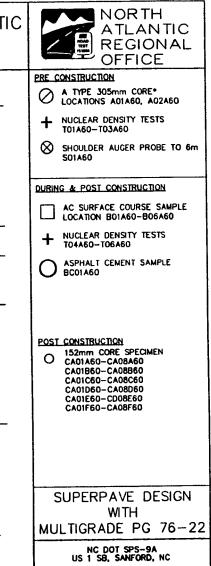




PHINA SPS-NA TEST SECTIONS ONLY

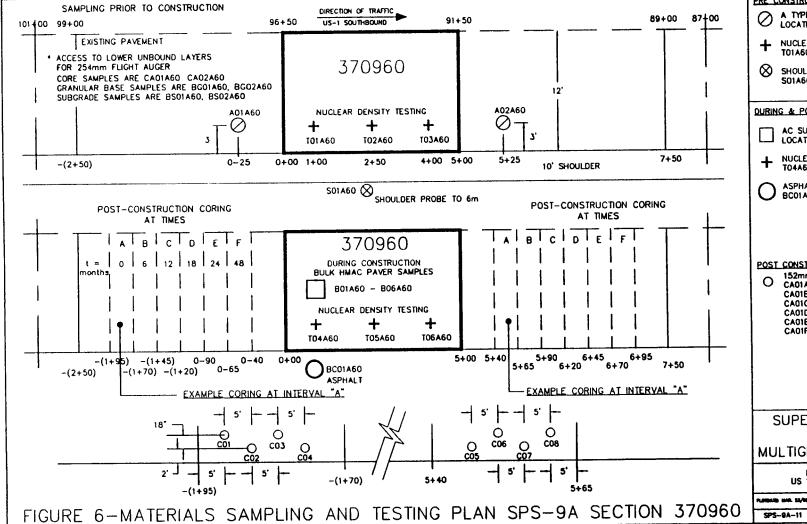






PHIM SPE-BA TEST SECROSS ONLY.
DISCIPLINAL DETAILS ONLY
DRAWING NOT TO SCALE

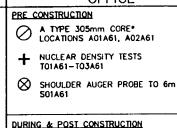
SPS-0A-11

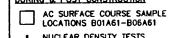


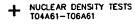
SAMPLING PRIOR TO CONSTRUCTION DIRECTION OF TRAFFIC 82+50 87+00 85+00 US-1 SOUTHBOUND EXISTING PAVEMENT ACCESS TO LOWER UNBOUND LAYERS FOR 254mm FLIGHT AUGER CORE SAMPLES ARE CA01A61 CA02A61 SUBGRADE SAMPLES ARE BS01A61, BS02A61 A01A61 T01A61 0+00 1+00 -(2+50)0-25 95 POST-CONSTRUCTION CORING AT TIMES

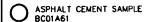
FHWA-LTPP SPS 9A, US1, SANFORD, NC. DESIGN SCHEMATIC VALIDATION OF SHRP ASPHALT SPECIFICATIONS AND MIX DESIGN AND INNOVATIONS IN ASPHALT PAVEMENTS











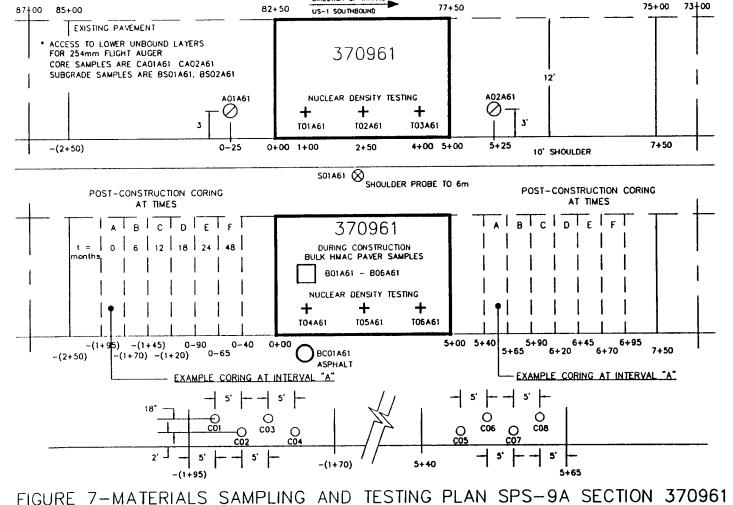
POST CONSTRUCTION

152mm CORE SPECIMEN CA01A61-CA08A61 CA01B61-CA08B61 CA01C61-CA08C61 CA01D61-CA08D61 CA01E61-C008E61 CA01F61-CA08F61

SUPER PAVE DESIGN WITH PG 64-22

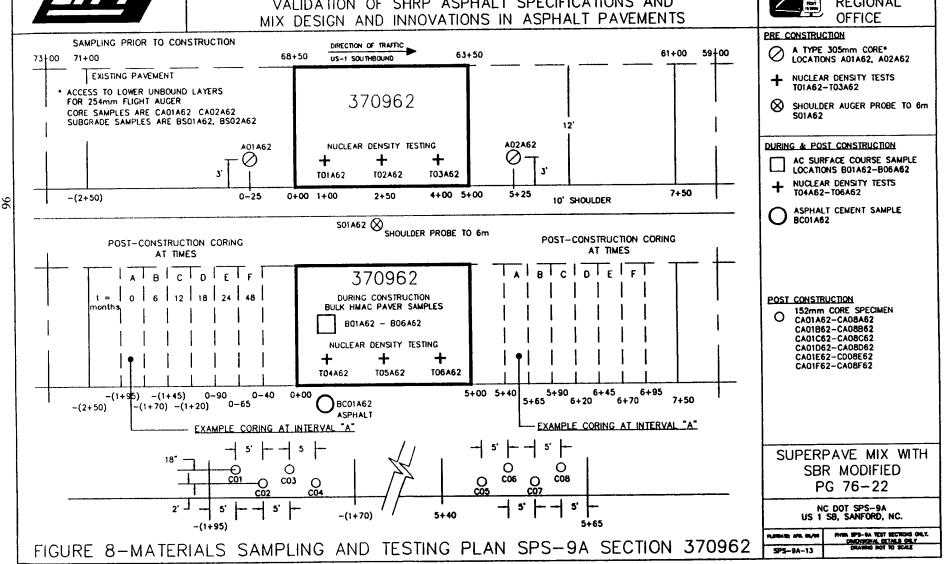
NC DOT SPS-9A US 1 SB, SANFORD, NC.

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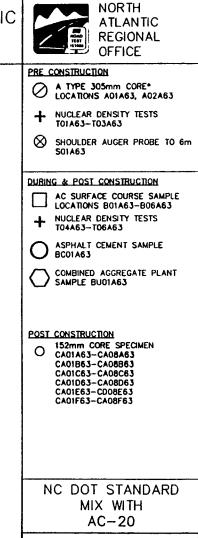


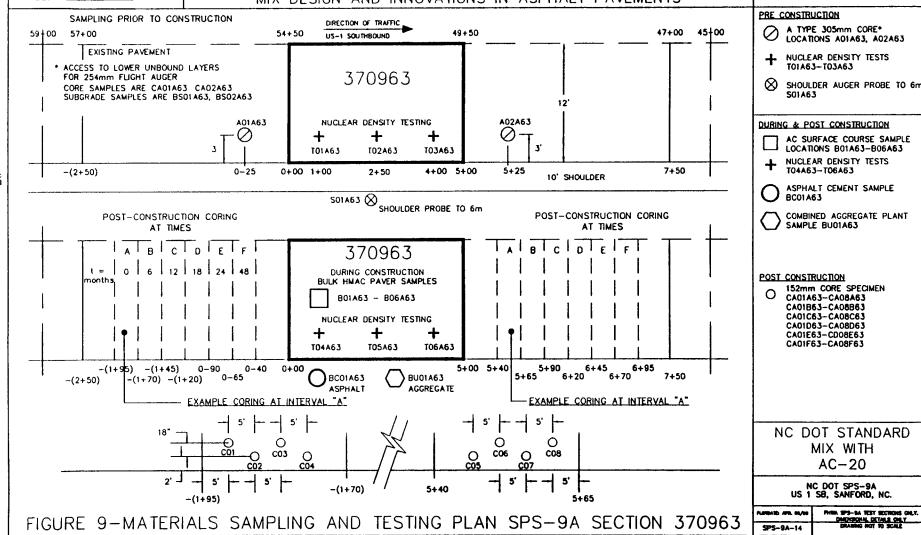








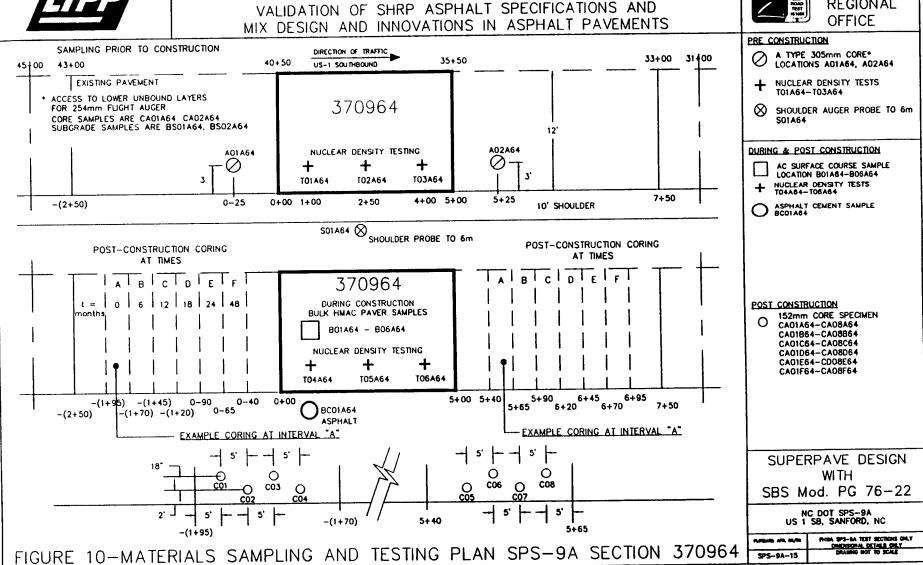




FHWA-LTPP SPS 9A, US1, SANFORD, NC. DESIGN SCHEMATIC VALIDATION OF SHRP ASPHALT SPECIFICATIONS AND



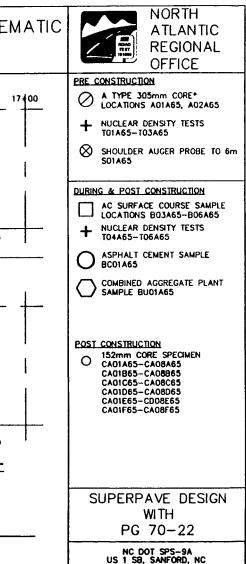
NORTH **ATLANTIC** REGIONAL





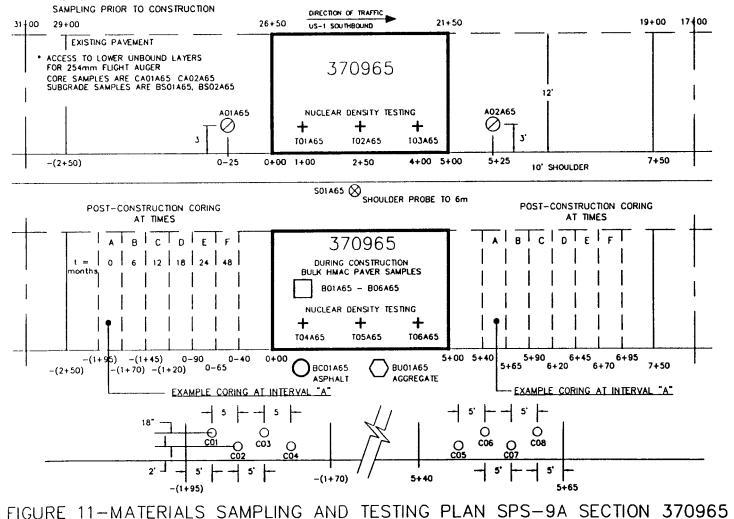
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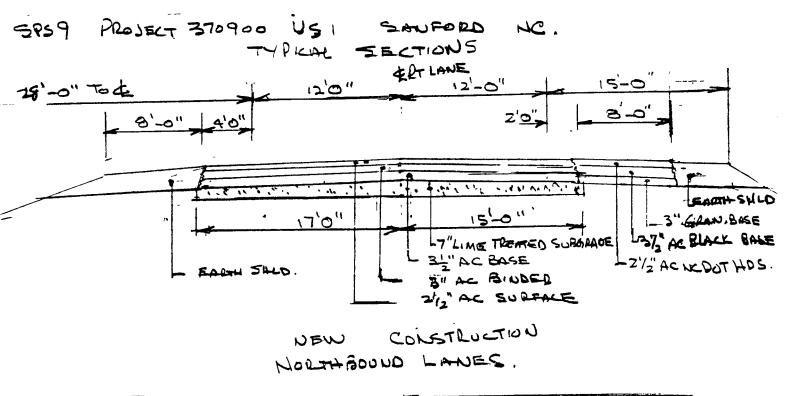
FHWA-LTPP SPS 9A, US1, SANFORD, NC. DESIGN SCHEMATIC VALIDATION OF SHRP ASPHALT SPECIFICATIONS AND MIX DESIGN AND INNOVATIONS IN ASPHALT PAVEMENTS

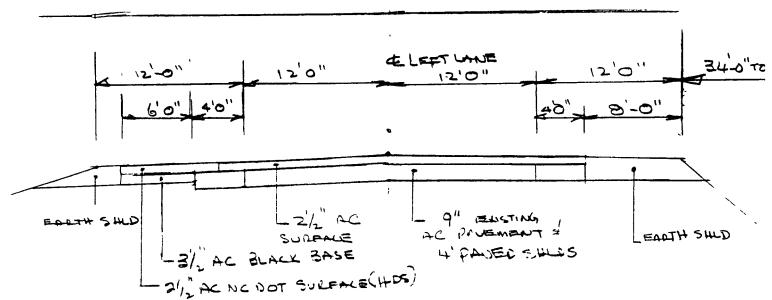


PHIM SPS-BA TEST SECTIONS OILY

DEADERS NOT TO SCALE







SOUTHBOUND LONES.

=16,12

LIST OF APPENDICES

Appendix A	Construction Highlights of Test Sections			
Appendix B	General Correspondence			
Appendix C	Sampling and Testing Plans Developed by NC DOT, Dr. Biswas			
Appendix D	Mix Design and JMF for Each Test Section			
Appendix E	Project Deviation Report			
Appendix F	Photographs			

Appendix A

Construction Highlights of Test Sections

CONSTRUCTION HIGHLIGHTS OF TEST SECTIONS

Test Section 370901 – Stations 53+00 – 58+00 North Carolina Standard Mixes with AC-20

The North Carolina DOT Mix Designs were used on all layers of this test section

The 3-1/2" Base Course (HB) was laid on May 16, 1997 The Contractor intended to use the Moncure Plant but because of problems at the Plant, switched to the Lee Paving Sanford Plant located 12 miles from the Project North Carolina DOT have had a lot of experience with these mixes and there were no mix design or laying problems

The temperature of the mix in the truck before unloading was 290° F The pavement was laid from North to South to a width of 14' and a nominal thickness of 4 2" The nominal thickness from 5+00-3+60 was 4 5" and from 3+60-0+00 was 4 2" The time to pave the monitoring section was 35 minutes and the 2 sample areas plus the monitoring section, 75 minutes from 3 05 -420 p m

Bulk HMAC samples were taken at 2+50 Three (3) bags were placed in an insulated container (cooler) to prepare 6 GCS, and 1 bag to carry out gradation, extraction and specific gravity tests in Raleigh, North Carolina DOT Laboratory

The average compacted thickness from the 5 point levels was 3 4". The Hypac breakdown roller made 2 passes and the 2nd Caterpillar roller was used as a static roller. The average compaction was 92 8%

The 3" Binder Course (HDB) was laid on May 22, 1997

Prior to laying the Binder Course, a CAT grader 12G removed a surface course layer from 0+45-0-20 which was placed in error. The mix came from the Moncure Plant. The pavement was laid from North to South to a width of 14' and to a nominal thickness of 3.5'. The mix temperature prior to unloading was 289° F and the air temperature was 77° F. It took 57 minutes to pave the 2 sampling areas plus the monitoring section from 12.40-2.05 p.m.

Bulk samples of the HMAC were taken at 2+50 Three (3) bags were placed in the cooler to prepare 6 SCS in Aberdeen and 1 bag to the Raleigh Laboratory

The average compacted thickness from the 5 point levels was 28"

Compaction was obtained from 2 passes of the CAT breakdown vibratory roller and 2 passes of the Hypac vibratory roller and a static roller was used to smooth out the surface Compaction was 95 6%

The 2-1/2" Surface Course (HDS) was laid on May 28, 1997, with the mix from the Moncure Plant. It was laid from North to South to a width of 14' and to a nominal thickness of 3". The truck temperature of the mix at the paver was 307° F.

The paving of the monitoring section took 32 minutes and the approach and leaving sample areas and the monitoring section took 82 minutes from $2\ 20 - 3\ 42\ pm$ The air temperature was 85° F

The Bulk Asphalt samples were taken at 2+50 at 1 35 pm. Three (3) bags were placed in the cooler to prepare 6 GCS for QC in Aberdeen and 1 bag for the Raleigh Laboratory

The average compacted thickness was 26" Compaction was obtained with 2 passes of the Hypac vibratory roller and with 2 passes of the CAT roller which was used as a static roller. The compaction was 97.9%

The Construction Data for the test section is shown in Tables 36, 37 and 38

Test Section 370902 – Stations 91+50 – 96+50 37.5, 19.0 and 12.5 Superpave Mixes with PG 64-22

This is the Superpave test section Verification of control strips were carried out on all of the mixes prior to production

The 3-1/2" Base Course was laid on May 14 with the mix from the Sanford Plant It was laid from South to North to a width of 14' and to a nominal thickness of 42" The average temperature of the mix in the truck at the paver was 266° F

The time to pave the monitoring section took 55 minutes from 5 55 - 6 50 pm. The air temperature was 80° F. Bulk HMAC samples were taken at 2+50 at 6 20 - 6 35 pm. Six (6) boxes were obtained for MRL, 11 boxes to the QA Laboratory (6 for MRL and 5 for NCAT) Fourteen (14) bags for the QA Laboratory to prepare 20 GCS for NCAT and 8 GCS for Law/NC DOT and 1 bag to the Raleigh M&T Laboratory. Three (3) bags were placed in the cooler for the QA Laboratory to prepare 6 GC samples for QC purposes

The average compact thickness from the 5 point level was 3 2" There were 3 compactors. A CAT breakdown vibratory roller. Hypac intermediate vibratory roller and Bomag static roller. The average compaction was 85 6%

The 3" Binder Course was laid on May 20, 1997 with the mix from the Sanford Plant The average mix temperature in the truck was 303° F The mix was laid from North to South to a width of 14 5' and to a nominal depth of 3 5"

It took 55 minutes to lay the monitoring section from 12 30 – 1 25 p m. The air temperature was 92° F. There was an overspill at the hopper at 4+50 which was then spread out manually. The bulk samples of HMAC was taken at the plant by Brad Comer and Mustan which consisted of 11 boxes (6 for MRL and 5 for NCAT). 15 bags to the QA Laboratory from which 20 GCS were made for NCAT and 8 GCS for Law/NC DOT and 1 bag was sent to the Raleigh Laboratory. Three (3) bags were placed in a cooler and taken to the QA Laboratory to make 6 GSC for QC purposes. At 3+00 – 94+50, a truck got stuck in the outside shoulder.

The average compacted thickness from the 5 point levels was 2.6". The Hypac vibratory roller made static passes on the center line, then 2 vibratory passes, the intermediate CAT roller made 2 vibratory passes and the static roller made 6 passes. The compaction was 91.1%

The 2-1/2" surface course was laid on May 28, 1997 with a mix from the Sanford Plant. The average temperature of the mix in the truck at the paver was 287° F. It was placed from North to South to a width of 14.5° and to a nominal thickness of 3.0"

It took 43 minutes to lay the monitoring section and 70 minutes to lay the approaching and a leaving sample areas and the monitoring section from 11 55 a m to 1 05 p m. The air temperature was 73° F. The bulk samples were taken at 2+50 at 12 25 – 12 40 p m. Five (5) boxes were taken for NCAT, 25 bags were taken for the QA Laboratory from which 20 GCS were to be made for MRL, 8 GCS for Law/NC DOT, 20 GCS for NCAT and 1 bag for the Raleigh Laboratory for extraction, gradation and specific gravity tests

The average compacted layer thickness as determined from the 5 point levels was 27" The Hypac vibratory breakdown roller made 2 passes, the intermediate CAT vibratory roller made 2 passes and the static roller was pushing and spreading the mix until it cooled The compaction was 94 7%

The Construction Data for section 02 is shown in Tables 36, 37 and 38

Test Section 370903 – Stations 33+50 – 38+50 Superpave Alternate 37.5, 19.0 and 12.5 Mixes with PG 70-22

This section was originally located between 30+50-35+50. Because of rain and the uncertainty of the void content mix, paving was stopped at 30+50 A joint within the test section would have been present. To avoid any possible influence the joint might have on the performance of the pavement, the test section was moved to 33+50-38+50. The QA Laboratory gyrating compactor was damaged by lightening and the void problem was resolved with cores

The 3-1/2" base course was laid on July 10, 1997 with a mix from the Sanford Plant It was placed from South to North to a width of 14 5° and to a nominal thickness of 4 2" The temperature of the mix at the paver was 302° F

The monitoring section was laid in 63 minutes and the approaching and leaving sample areas and the monitoring section in 93 minutes between 8 15 and 9 48 a m. The air temperature was 84° F.

Bulk samples were taken at 2+50 between $9\ 00-9\ 20\ p$ m. The samples consisted of 5 boxes for NCAT, 15 bags to the QA Laboratory from which 20 GCS were made for NCAT, and 8 GCS for Law/NC DOT and 1 bag for the Raleigh Laboratory. An additional 3 bags were placed in a cooler and taken to the QA Laboratory to prepare 6 GCS for quality control purposes

The average compacted thickness was 3 4" Compaction was obtained from 3 rollers, 3 passes with the CAT vibratory breakdown roller, 3 passes with the second CAT vibratory roller and 3 passes with the static roller. The compaction was 90 2%

The 3" binder course was laid on July 11, 1997 with the mix from the Sanford Plant The mix was laid from North to South to a width of 14" and to a nominal thickness of 3.5". The mix temperature of the mix at the paver was 327° F. It took 42 minutes to lay the monitoring section and 71 minutes to lay the approaching and leaving sample areas and the monitory section from 9.38% at 10.49 a m.

Bulk samples were taken at 2+50 between 10 13 – 10 28 a m consisting of 5 boxes for NCAT. 14 bags to make 20 GCS for NCAT and 8 GCS for Law/NC DOT, and 1 bag for the Raleigh Laboratory Three (3) bags were also placed in a cooler for the QA Laboratory to prepare 6 GCS for QC purposes

The average compacted thickness from the 5 point levels was 29". Three (3) passes were made by the first CAT vibratory roller, 2 passes by the second CAT vibratory roller and some passes by the static roller. The compaction was 92.8%

The 2-1/2" surface course mix obtained at the Sanford Plant was laid on July 12, 1998 from North to South to a width of 14" and to a nominal depth of 30". The mix in the truck at the Plant was 324° F.

It took 48 minutes to lay the monitory section and 93 minutes to lay the approaching and leaving sample areas and the monitoring section from 8 47 to 10 20 a m. The air temperature was 87° F.

Bulk samples were taken at 2+50 consisting of 6 boxes (5 for NCAT), 15 bags, 14 of which were sent to the QA Laboratory to prepare 20 GCS for NCAT, 8 GCS for Law/NC DOT, and 1 bag to the Raleigh Laboratory Three (3) bags were also placed in a cooler for the QA Laboratory to prepare 6 GCS for QC purposes

The compacted thickness of the surface layer from the 5 point levels was 2 4" Two (2) CAT vibratory rollers were used The compaction was 91 4"

At 0-150 (32+00), there was an overspill at the hopper which was leveled out manually While obtaining a binder sample at the storage area, it was noted that a new load of binder arrived There was concern that the binder may not be PG 70-22 since a little more paving still had to be done. To be sure, a sample was taken by Dr. Biswas from the new load for binder verification.

The Construction Data for the test section is shown in Tables 36, 37 and 38

Test Section 370960 – Stations 101+00 – 87+00 12.5 Superpave Mix Design with Multigrade PG 76-22

The first tank truck of asphalt binder arrived at the Plant at 9 30 a m from Suitkote. N Y on Thursday, September 10, 1998 The second load arrived at 11 00 a m Both of the trucks were expected to arrive at 3 00 a m

The asphalt binder arrived at a temperature of 250° F and had to be heated to 300° F before venfication of the JMF could start. The first verification results became available at 11 00 p m. The mix was not acceptable because of the low void content. The second verification was made by 10 00 a m, Friday. September 11, 1998. It too was rejected because of the low void content. The third venfication was completed by 5 00 p m, and was accepted by Brad Comer.

The first lift of hit mix. following the application of tack coat, was placed on the inside lane on Saturday, September 12, 1998. The first lift of the driving lane followed after an application of the tack coat between 11 30 a m and 1 10 p m which also included a waiting time of 30 minutes for the last load. It was hot and humid and the air temperature was 85° F. The second lift of the driving lane followed the first lift without any tack coat and was placed between 2.00 - 3.00 p m. The curing time was 2 hours. The air temperature was 90° F.

The haul from the Plant to the road was about 12 miles. The average time from loading to the start of unloading for the first lift was 25 minutes and 54 minutes for the second lift. The Plant continued to produce the mix for the second lift while continuing compacting of the first lift and preparing the joint for the second lift. Five (5) trucks were backed up at the start of the second lift but because of the hot weather, there was no significant loss in temperature of the mix while waiting

The temperature of the hot mix was taken at the truck before unloading. The laydown temperature was taken immediately behind the paver with an infrared thermometer. The mixing temperature was 350° F and the laydown temperature was 320° F. The breakdown roller stayed 25' behind the paver and the intermediate roller, 200' behind the breakdown roller. There were no laying problems but there was an overspill at the paver at 0-100 (97+50) on the second lift which was spread out from 97+50-97+00

Beth Chapin checked the densities and compaction of the roller coverage's One coverage was considered to be an up and down pass. The coverage's for both the breakdown and intermediate were 12 for each lift with a speed of 3 MPH for the breakdown roller and 4 MPH for the intermediate roller. The compaction results appeared low. Dr. Biswas and Graham Johnson believed that the underlying hot first lift could affect the compaction of the second lift surface.

course It was decided that a lane change would be required on all subsequent test sections before the next lift is placed to extend the curing time a few hours

The Construction Data for the test section is shown in Tables 36, 37A and 38

Test Section 370961 – Stations 87+00 – 73+00 12.5 Superpave Design with PG 64-22

The original Materials Sampling and Testing Plan called for a SMA mix with Contractors choice of PG 76-22 However, an acceptable SMA mix design could not be obtained so Dr Biswas switched to a 12 5 Superpave Design with PG 64-22 The Asphalt Binders were supplied by CITGO, Wilmington, NC North Carolina DOT regularly used this mix design and JMF had already been approved

The paving was to start on Monday, September 14 However, the Plant broke down and the first lift of the passing lane was placed on Tuesday, September 15 from $9\ 00-10\ 30\ a$ m. The Plant broke down again for the rest of the day. The first lift of the driving lane, after the tack coat was placed to a nominal thickness of 1-1/2" on Wednesday. September 16 from $9\ 30-11\ 30\ a$ m. including a 40 minute wait for the last load. The weather was sunny and hot and the air temperature was 81° F. The second lift, after a tack coat and a 6 hour curing time, was placed on the driving lane from $4\ 15-5\ 50\ p$ m which included a 50 minute wait for the last load. The air temperature was 91° F.

The haul from the Plant to the road was 12 miles. The average time for loading to the start of unloading was 54 minutes for the first lift and 23 minutes for the second lift. The mixing temperature was 320° F and the second lift, 293° F

There were no laying problems An experienced roller operator was brought in to operate the breakdown roller. He adjusted the amplitude to low but retained the same 3200 frequency. He made 12 coverage's for both lifts with a speed of 3 mph.

The intermediate Hypac roller also acted as the static roller. The speed was reduced to 3 mph. It made 9 coverage's of the first lift and 6 coverage's of the final lift.

The nuclear density tests showed an improvement in compaction of the previous section

The Construction Data for the test section is shown in Tables 36, 37A and 38

Test Section 370962- Stations 73+00 - 59+00 12.5 Superpave Design with SBR Mod. PG 76-22 Citgo Wilmington, NC and the SBR by RUB-R-Road Co-Polymer Kent, Ohio

David A Carlson, Technical Director of Rub-R-Road was on hand to set up the equipment Rub-R-Road was added to the mix at the pug mill from drums. The JMF was venfied the previous day on Wednesday. September 16

The Contractor was to start early Thursday. September 17 but he first filled-up the silo for other uses and hence the driving lane was laid between 3.05-4.45 p m which included a 40 minute waiting period for the last load. The weather was sunny, hot and humid and the air temperature was 88° F. Traffic continued in the passing lane and the second lift of the driving lane was placed on Friday. September 18, between 8.00-9.40 a m with a tack coat between the lifts after a curing time of 16 hours. The weather was slightly foggy until 9.15 a m, then hazy with air

temperature at 75° F The mixing temperature was 350° F The haul distance was 12 miles and the time from load to unload for the first lift was 20 minutes and the second lift, 26 minutes

It was readily apparent that the laydown mix was hot. Only 2 rollers were in use, the breakdown roller and the intermediate roller which was used as a vibratory and a final roller. The breakdown roller went right up to the paver then held back until the pavement had cooled. On both lifts, the intermediate roller held bath 500' behind the breakdown roller. Beth Chapin took density readings after a pass or two of the breakdown and intermediate rollers in order to determine a rolling pattern. She found the best results when the pavement had cooled for a few minutes. After the initial coverage of the breakdown roller, she also discovered that increased densities could not be obtained if the mix was moving underfoot. Too much compaction produced lower densities. In the end, the breakdown roller made 12 coverage's and the intermediate roller 6 coverage's with vibrations and 6 without vibrations. Pick up was not a problems but a litre of Joy dishwashing liquid was placed in the water of the compactors for insurance.

The Construction Data for the test section is shown in Tables 36, 37A and 38

Test Section 370963– Stations 59+00 – 45+00 North Carolina DOT Standard Mix with AC 20

Verification of the JMF was not required on this test section because the mix was previously verified. The asphalt binder was supplied by CITGO, Wilmington, NC

The first lift was placed in the passing lane on Friday afternoon. September 18 followed by the first lift of the driving lane. The first truck on the driving lane was a carry over load from the passing lane and it took 30 minutes to switch to the driving lane to empty the load. Four trucks had lined up at the start and continued to line up for the paving of the driving lane from 4 50 – 5 40 pm. The weather was cloudy and warm, air temperature was 87° F.

A tack coat was placed and the second lift was placed on Monday. September 21 from 8 15 – 9 30 a m after 2-1/2 days of curing. The hot mix came from the silo because the Contractor wanted to empty the asphalt binder tank early to verify the mix for the next test section.

There was no laying problem with the mix. There was an overspill of the paver at station 4+60 (49+10) of the second lift which was leveled out from (49+10 – 48+50), 4+60 – 5+50. The haul distance was 11 miles. The average load to unload time for the first lift was 38 minutes and for the second lift, 31 minutes. The mixing temperature was 350° F and the laydown temperature for the first lift was 324° F and the second lift, 331° F. Only 2 rollers were used. The CAT breakdown roller and the intermediate Hypac roller for the first lift. Due to the breakdown of the Hypac, the CAT breakdown and Ferguson-Steel Wheel tandem were used for the second lift. Adequate compaction was obtained readily

The Construction Data for the test section is shown in Tables 36, 37A and 38

Test Section 370964 Stations 45+00 – 31+00 Superpave Design with SBS Mod. PG 76-22

The Asphalt Binder was obtained from Koch Savannah, GA It was expected to arrive at 6 00 a m, Tuesday, September 22 The first tank truck arrived at 8 00 a m and the second, having 2

flat tires, arrived at 2 00 p.m. The asphalt binder had cooled to 275° F and was heated to 375° F before producing a batch for verification

Two venification tests were carried out by midnight. September 22. Both failed because of low voids The third verification was completed by 11 00 a m on Wednesday, September 23 It also failed because of the low voids The fourth venification was completed by 3 00 p m and the mix was approved

The Contractor placed on lift on one lane from $4\ 30-6\ 00\ p$ m Through a misunderstanding, the first lift was placed on the driving lane instead of the passing lane The weather was sunny and the air temperature was 73° F

The Contractor had intended to start paving at 7 30 a m , Thursday, September 24 During the night, the flame went out on the burner of the asphalt binder storage tank and the binder temperature reached 275° F The binder was heated to 325° F by 12 30 p m The second lift of the driving lane was placed from 3 05 - 4 25 p m , after 22 hours of curing time The QC samples were taken at the mid-point of the monitoring section by Brad Comer on the second lift instead of the first lift The weather was sunny and the air temperature was 73° F

The haul distance was 11 miles and the load to unload time for the first lift was 27 minutes and the second 19 minutes. The mixing temperature was generally 350° F, although it reached 375° F at one point as recorded from the truck measurement. The average laydown temperature was 324° F for the first lift and 331° F for the second lift.

The intermediate Hypac roller had broken down and it was replace with a 12 T Caterpillar double-drum vibratory roller similar to the breakdown roller. The density tests obtained by Beth Chapin for the first lift were coming in low. She tried different rolling patterns but was not successful because the pavement cooled rapidly. The compaction results of the second lift were better. All of the rollers were brought to operate closer together. The laydown temperature of both lifts were similar but the second lift produced a lot of steam during laydown (Photo 15). The breakdown roller came right up to the paver.

The Construction Data for the test section is shown in Tables 36, 37A and 38

Test Section 370965 Stations 31+00 – 17+00 Superpave Design with PG 70-22

The Asphalt Binder was supplied by CITGO. Hopewell. VA It was expected to arrive at 6 00 a m on Friday. September 25 The first tank truck arrived at 8 00 a m and the second at 9 10 a m with a binder temperature of 250° F The binder was heated to 290° F by 1 30 p m at which time the verification tests started. The mix was approved at 4 30 p m

One lift of the passing lane was placed between $5.35-6.50~\mathrm{pm}$ The first and second lifts of the driving lane were placed on Saturday. September 26 The first lift used about 40' of hot mix left over from the passing lane starting at 30+00 At the beginning of the joint of the first lift, an adequate nominal thickness was not being obtained and the paver backed up and then carried on with the right thickness. Some trucks were lined up at the start. The first lift was laid from $7.45-9.50~\mathrm{am}$ with a 30 minute waiting period for the last load at 18+00. The weather was sunny and warm, the air temperature was 70° F

The second lift was placed from $12\ 40 - 2\ 04\ p$ m after a 5 hour curing time. The weather was sunny and hot, the air temperature was 84° F

The haul distance was 11 miles with an average load to unload time for the first lift of 39 minutes and for the second lift, 20 minutes. The mixing temperature for the first lift was 350° F and the second lift, 360° F

The laydown temperature for the first lift was 300° F and the second lift was 348° F

The breakdown roller worked right up to the paver and the intermediate roller was close behind. The final steel-wheel roller picked the time to make the final passes to obtain a smooth finish but was usually about 500' behind Beth Chapin was satisfied with the densities and compaction tests. The breakdown roller made 9 coverage's, the intermediate roller made 6 coverage's and the final roller about 2 coverage's

The Construction Data for the test section is shown in Tables 36, 37A and 38

APPENDIX B

General Correspondence





STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

JAMES B. HUNT. JR. GOVERNOR DIVISION OF HIGHWAYS P.O. BOX 25201, RALEIGH, N.C. 27611-5201 R. SAMUEL HUNT III

March 14, 1995

Ivan J. Pecnik, P. E.
LTPP Regional Engineer
Pavement Management Systems Limited
415 Lawrence Bell Dr., Unit 3
Amherst, New York 14221

SUBJECT: SPS-9A SUPERPAVE Asphalt Binder Study Candidate Project Nomination

Dear Mr. Pecnik:

Per Appendix-A of your document "...Guidelines for Nomination and Evaluation of Candidate Projects for Experiment SPS-9A ...," attached please find filled out forms containing pertinent information about the project that North Carolina Department of Transportation (NCDOT) wishes to nominate for candidacy. In the following, we are also providing you with additional information regarding the project and our experimental design of SPS-9A.

SITE

The project (NC-HIP#R2500A) is about a 14 km stretch of US-1 in Lee and Chatham counties in North Carolina. The project will consist of widening an existing two lane roadway to a four-lane divided freeway. The scheduled letting date is January 16, 1996.

The existing two-lane roadway pavement is mostly asphalt concrete with a stretch of Portland cement concrete. As a part of the project, the existing pavement will receive asphalt concrete overlay and will become the south-bound part of the freeway.

The north-bound part will be all new construction including an uniform 9" thick asphalt concrete pavement over chemically stabilized base. The three main SPS-9A sections will be incorporated in this north-bound "new-construction" part of the project. We are also reviewing with our field forces the incorporation of one or more supplemental sections.



Mr. Ivan Pecnik Page 2 March 14, 1995

The terrain at this scenic Piedmont location in the central part of North Carolina is primarily flat with occasional mild grades. Predominant upland soil type is Mayodan-Pinkston consisting of gently sloping to steep, well drained soils that have a loamy surface layer and a clayey and loamy subsoil.

Geologically, the area is in the Deep River Basin which is a rift basin of early Mesozoic Age (about 200,000,000 yrs., slightly older than the Jurassic period). Rocks in the area are Upper-Triassic, Chatham group of sedimentary type. The region is traversed by a few intersecting stable faults.

CLIMATE

Annual rainfall in the area is about 1200 mm. Precipitation is quite evenly distributed throughout the year, with about 660 mm (55%) falling in April through September.

Every few years late in the summer or in the autumn, a tropical storm moves inland from the Atlantic Ocean and causes extremely heavy rain for one to three days. The heaviest one-day record rainfall was 131 mm at Moncure on August 11, 1967. Thunderstorms occur on about 45 days each year, and most occur in the summer.

The average seasonal snowfall is 130 mm. On the average, only one day has at least one inch of snow on the ground.

TRAFFIC

Traffic design basis is 166,000 ESAL/year over a 20 year period totalling 2,320,000 ESALin the design lane. Experienced construction and maintenance engineers from the NCDOT 8th Division have assured us that with adequate traffic control, one would be able to perform tasks of the SPS-9A experiment without much discomfort.

EXPERIMENTAL DESIGN

The narrative hereafter will refer to your document entitled " .. Experimental Design and Research Plan...," September 1994

Mr. Ivan Pecnik Page 3 March 14, 1995

The SPS-9A part of the project will include a total of five sections, consisting of three main sections and two supplemental sections. The three main sections will consist of
(i) a conventional section using a current NCDOT mix design and a conventional AC grade binder, (ii) a baseline SUPERPAVE section using a SUPERPAVE mix design and a PG grade binder and (iii) an alternative SUPERPAVE section using a SUPERPAVE mix design and a PG grade binder that is "higher" than that required by SUPERPAVE.

To provide production efficiency, each section is expected to be about 0.80 km long.

Temperature Factor

The nearest weather station is at Moncure in Chatham County. Referring to Appendix B, the listing on page B-17 indicates, at 98% reliability, pavement temperatures of 61°C maximum and -16°C minimum, and a recommended SUPERPAVE binder grade of PG 64-16.

Moisture Factor

Precipitation information as provided in the "CLIMATE" section earlier is consistent with your Appendix A, i.e. ≥ 1016 mm, and referring to the Table 1, we are in a "Wet" area i.e. > 635 mm.

Asphalt-Aggregate Mixture Design Factors

i) Conventional Section.

Consistent with the current standard practice, a Marshall test based mix design using a conventional AC-20 binder will be placed.

ii) Base-line SUPERPAVE Section:

Based on the temperature-moisture factorial, the indicated binder is PG 64-16. (Appendix B and Table-1) In consideration of the fact that nearly all binders that are used and available in North Carolina in particular and in the South-East in general fall in the PG 64-22 category and since the low temperature (LT)-22 covers LT-16, we choose PG 64-22 as the base-line binder.

iii) Alternative SUPERPAVE Section.

In consideration of the pleasant climate of our Southeastern part of the country, NCDOT will choose "rutting" as the distress type that the alternative binder selection will tend to minimize or prevent.

Mr. Ivan Pecnik Page 4 March 14, 1995

If we were to choose a PG grade that will theoretically result in earlier occurrence of pavement distress in rutting, we would have to choose a PG 58-22 binder. In Table-1 this would be a block that is one step to the <u>left</u> of the PG 64-22 block. Such a choice is strongly discouraged by the practicing professionals of owners as well as producers. Choice of PG 58-22 is considered unrealistic, undesirable and unwise.

Specification of PG 58-22 would result in obtaining a binder that would fall in the conventional grade of AC-10. AC-10 is a relatively thinner asphalt and is not used as binder for primary pavement mix anywhere in the South-East. AC-10 in any other name, e.g., PG 58-22, is still AC-10! Early and drastic pavement failure due to use of such a product is believed to be certain and it would not constitute an "experiment". It would not be acceptable to the engineering professionals of our 8th Division who, in fact, will have to live with the pavement on a daily basis. To knowingly choose an experiment with certain, early drastic failure as its result would simply not be a responsible act and would erode all support for any future experiments, such as SPS-9B.

This leads us to the only other choice, that is to move to the <u>right</u> of the PG 64-22 block which is to choose PG 70-22. Unfortunately, PG 70-22 binder is not commonly available either. Casual specification of PG 70-22 would result in obtaining either modified or treated (e.g. air-blown) asphalt. To eliminate additional variables in our experiment, we would like to avoid such materials at this time, especially in one of the main test sections.

Fortunately, however, at least one producer has assured us that especially for the purpose of the proposed SPS-9A experiment, they would produce a "straight-run" PG 70-22 binder and it would be available "locally", i.e., either from Wilmington, N.C. or Savannah, Ga.

We believe that the use of PG 70-22 would yield a number of benefits. Instead of seeking a lower limit, it would allow us to seek an upper limit. Potentially better performance due to choice of a higher grade binder would prove the converse hypothesis that lesser performance (early rutting) would result due to choice of a lower grade binder. Lastly, the SHRP-SUPERPAVE mix design technology is still "new". Choice of a better grade binder would provide a "cushion" against any uncertainty in mix design.

In summary, for the alternative SUPERPAVE section, a straight-run PG 70-22 would be the binder of our choice.

Mr. Ivan Pecnik Page 5 March 14, 1995

Supplemental Sections

Our tentative interest at this time is to also include two supplemental sections in the SPS-9A experiment. One is expected to be the use of SMA (Stone Mastic Asphalt) and the other possibility is the use of a polymer modifier. The polymer modifier could be an SBS or an SBR. The decision and related design and specifications remain to be finalized. The 9 inch pavement thickness over chemically treated base will remain the same.

Due to reported superior performance of SMA and asphalt concrete made with polymer modified binder in managing reflective cracking, our 8th Division personnel have suggested our pavement design personnel to consider use of such materials as overlay on existing PCC pavement on the southbound roadway. Although such application in the project would not be part of the SPS-9A experiment, it would provide interesting opportunity for comparative evaluation of performance of such applications as new pavement vis-a-vis as overlay on rigid pavement.

Concluding Comments

It is expected that SUPERPAVE based pavements will perform better than, or as at least as well as, conventionally specified and designed pavement. Superior performance due to the use of higher grade material in the alternative SUPERPAVE section will not come as a surprise. The real value will be in developing experience in the use of SHRP equipment, methods and technology. Positive experience gained in this experiment will provide us with the confidence and the knowledge base to address future SHRP implementation experiments, such as SPS-9B.

Different Units of our Department, including Pavement Management, Construction. Maintenance, Materials and Tests, Research and Development and the professional personnel of the 8th Division have actively contributed towards development of this nomination and are eager to participate in the SPS-9A experiment. We also received valuable input from several members of the Southeast Regional User-Producer Group. They are also eager to participate in this experiment.

I am enclosing a North Carolina State Transportation map highlighting the location of the proposed site.

Mr. Ivan Pecnik Page 6 March 14, 1995

We look forward to your favorable consideration of our nomination for candidacy.

Sincerely yours,

Mrinmay "Moy" Biswas, Ph. D., P. E.

Pavement and Materials Research Engineer

Research and Development Unit

Telephone: 919 715-2465

FAX:

919 715-0137

cds

Attachments

cc: Mon

Monte Symons, P. E. (FHWA)

Max Tate, P. E. (FHWA)

Gonzalo Rada, Ph. D., P. E. (PCS/Law)

John Miller, P. E. (PCS/Law)

Larry Goode, Ph. D., P. E.

Don Goins, P. E.

C. A. Gardner, P. E.

Whit Webb, P. E.

Fred Whitesell, P. E.

Oscar (Buck) Clark, P. E.

Lex Kelly, P. E.

Ken Creech, P. E.

Jack Cowsert, P. E.

Dick Reaves, P. E.

Cecil Jones, P. E.

Len Sanderson, P. E.

Steve DeWitt, P. E.

Jim Grady, P. E.

Frank Pace, P. E.

Jim Trogdon, P. E.

Pat Strong, P E.

Mr. Ivan Pecnik Page 7 March 14, 1995

REFERENCES

FHWA-USDOT, LTPP Division, "Specific Pavement Studies, Guidelines for Nomination and Evaluation of Candidate projects for Experiment SPS-9A, SUPERPAVE Asphalt Binder Study", August, 1994.

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Olsen, Paul E., et al, "Rift Basins of Early Mesozoic Age," in *The Geology of the Carolinas*, Horton, J. Wright, Jr. and Victor A. Zullo, Eds., The University of Tennessee Press, Knoxville, 1991.

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& 2

SHEET A. SPS-9A CANDIDATE PROJECT NOMINATION AND INFORMATION

STATE North Carolina	SHRP SECTION NO. 370900			
GENER PROJECT LOCATION	AL PROJECT INFORMA	ATION		
ROUTE NUMBER 1 ROUTE SIGNING [] Interstate Other	 e (x)U.S. []S	tate [] County		
Start				
	ON <u>US 1 from North</u>	of US 15-501 in Lee County to		
COUNTY HIGHWAY AGENCY DISTRICT N	UMBER	Lee and Chatham Divn. 8, Districts 1		
ENVIRONMENTAL CONDITIONS				
AVERAGE 7-DAY MAXIMUM PAVEMENT DESIGN TEMPERATURE	MINIMUM PAVEMENT DESIGN TEMPERATURE	MOISTURE (Annual Precipitation)		
< 52C (126F) [] < 58C (136F) [] < 64C (147F) [x]	> -46C (-51F) [] > -40C (-40F) [] > -34C (-29F) []	< 625 mm (25 inches) []		
< 70C (158F) ()	> -28C (-18F) [] > -22C (-8F) [X] > -16C (3F) [] > -10C (14F) []	> 625 mm (25 inches) &)		
SIGNIFICANT DATES				
LATEST DATE OF APPROVAL NO CONTRACT LETTING DATE	OTIFICATION FROM FH	WA LTPP <u>August 31, 1995</u> January 16, 1996		
ESTIMATED CONSTRUCTION ST	ART DATE	March 4, 1996		
ESTIMATED DATE TEST SECTIONS OPENED TO TRAFFIC				
ESTIMATED CONSTRUCTION COMPLETION DATE		July 1, 1998		

SPS-9A Nomination Form/July 94

SHEET A. SPS-9 CANDIDATE PROJECT NOMIGATION AND INFORMATION FORM (Continued)

PROJECT DESCRIPTION

DESIGN PERIOD (Years)

PROJECT TYPE [X] New Route [] Hesurfacing Flexible [] Resurfacing High					
Other Widening existing two-lane roadway to a four-la	ne divided freeway.				
New north-bound two-lane AC roadway will contain SPS	-9A sections. Existing				
south-bound roadway (both AC & PCC) will receive ove	rlay but no SPS-9A section.				
FACILITY [X] Divided [] Undivided NUMBER OF L	ANES (One Way) 2+2				
DESIGN TRAFFIC DATA					
ANNUAL AVERAGE DAILY TRAFFIC (TWO DIRECTIONS)	14,800 VPD				
% HEAVY TRUCKS AND COMBINATIONS (OF AADT)	11%				
EST. 18K ESAL RATE IN STUDY LANE (1,000 ESAL/YR)	166,000 ESAL/YR				
TOTAL DESIGN 18K ESAL APPLICATIONS IN DESIGN LANE	_3,320,000 FSAL				
DESIGN PERIOD (Years)	20 vrs.				

SHEET B. SPS-9 CANDIDATE PROJECT NOMINATION AND INFORMATION FORM

SIAIE NC		SHRP SECTION NO.				
	AGENCY'S PAVE	MENT STRUCTURE	DESIGN FOR SIT	E		
LAYER'	LAYER ²	MATERIAL TYPE	THICKNESS*	STRUCTURAL ⁵		
NO.	DESCRIPTION CODE	CLASS CODE	<u>(mm)</u>	COEFFICIENT (per mm)]		
1	SUBGRADE (7)	5 2		ssv=3.5		
2	0 6	4 <u>2 or 4</u> 3	203 2	0.0055		
3	0 5	2_8_	8 8 • 9	0.012		
4	0 3	0_1_	<u>139.7</u>	0 <u>•01</u> 7		
5				0		
6				0		
7				0		
8	 .			0		
9				0		
STRUCTURAL	DESIGN METHOD					
[X] 1972	AASHTO [] 1986 A	ASHTO [] 1993 A	ASHTO [] Mod	lified AASHTO		
	ner					
	GN RELIABILITY FACT	ORS R%		S _{o_}		
OUTSIDE SHO		_				
	Granular [x]					
	Curb and Gutter					
	ULDER WIDTH (Meter)			3.05		
SUBSURFACE	EDGE DRAINS (SAG VE	RTICALS & FLATGRA	ADES) [x]	Yes [] No		
NOTES						
1. Layer 1 is the	natural occurring subgrade so	oil. The pavement surfac	e will have the larges	t assigned layer number.		
2. Layer descripti						
Surface Layer:	·		ibgrade: 07			
Subsurface HM			nbankment (Fill): 11			
	s A-1 through A-4 for materia pth to a rigid layer is known,		rade thinkness other	nuise leave subgrade		
4 If subgrade de	pun to a rigio layer is known,	enter this depth for subg	1846 UHCAHESS, UHIEL	11120 10010 0003.000		

5. Enter AASHTO structure layer coefficient value, as appropriately modified, used in pavement design or typical

coefficient used by agency for this material. For the subgrade, enter either AASHTO soil support value or resilient

layer thickness blank.

modulus value (psi) used in design.

SHEET C. SPS-9A CANDIDATE PROJECT NOMINATION AND INFORMATION FORM

STATE_NC	SHAP SECTION NO				
TEST S	ECTION LA	YOUT			
NUMBER OF TEST SECTIONS ENTIRELY OF SHORTEST TRANSITION BETWEEN CONSIDERATION OF SHORTEST TRANSITION BETWEEN CONSIDERATION OF SHORTEST COMMENTS ON DEVIATIONS FROM DESIRED FILL FILL for the new (NB) two-lane	ECUTIVE T downgrade RED SITE L roadway	EST SECT) (x) Tange OCATION to be use	TIONS (meters nt I CRITERIA ed for SPS-9)50	-1%
constructed in 1975 or earlier (at the				(SB) tw	<u>70-lane</u>
roadway was constructed)					
					
			—————————————————————————————————————		
OTHER SH	RP TEST S	ECTIONS			
DOES AGENCY DESIGN CONFORM TO GET PROJECT CRITERIA? DISTANCE TO NEAREST GPS TEST SECTION NUMBER OF NEAREST GPS ARE OTHER SPS SECTIONS LOCATED ON IF YES: [] SPS-1 [] SPS-5	ON ON SA S SECTION I SAME PRO	ME ROUT I OJECT?	[*] YES E (Miles) [*] YES] NO	N <u>/A</u> 371 <u>992</u>
SUPPLEMEN	TAL TEST	SECTIONS	5		
IF SUPPLEMENTAL EXPERIMENTAL TEST FOLLOWING:	SECTIONS	ARE PRO	POSED, COMI	PLETE TH	łE
TOTAL NUMBER OF SUPPLEMENTAL TES	T SECTION	IS			2
FACTORS TO BE INVESTIGATED For rul	ting-resi	stance i	nvestigation	, pendir	ng final
design decision, one section is anti-	ripated to	utilize	SMA and the	other s	section_
is anticipated to utilize polymer mod	lified bir	der. To	control ref	<u>lective</u>	
cracking, such materials will also be used as over-lay on existing PCC pavement.					
but will not be part of SPS-9A exper-	ments.			· · · · · · · · · · · · · · · · · · ·	



MEMORANDUM

TO

Ivan Pecnik

DATE

April 18, 1995

FROM

Bill Phang Bill thang.

PROJECT

50451010

SUBJECT

NC DOT SPS-9 Project 370900,

FILE

13.18.9

US-1 NB, Moncure, NC

The nomination from North Carolina for an SPS-9A project to be constructed as part of the widening of US-1 to form two new northbound lanes starting from north of US-15-501 to north of SR 1012 (13.87 km) has been reviewed.

The earthworks for the widened pavement was constructed as part of the original roadbed in 1975 or before. There is ample length of project to accommodate the three SPS-9A test sections and at least two supplemental test sections.

The pavement structure consists of 200mm of lime or cement treated subgrade on which is placed 90mm of asphalt treated base and 140mm of asphalt concrete surfacing. There is no concern about the minimum lift thickness of 63.5mm. Pavement edge drains will be used throughout the project.

It is to be noted that the alternative PG 58-22 asphalt binder suggested in the guidelines to test for rutting was not acceptable to the NC DOT as in their experience, AC-10 asphalt cements (a binder similar to PG 58-22) would develop ruts very quickly.

Although climatic conditions in this part of NC are not severe enough to test for low temperature cracking, the project design is certainly more appropriate for this purpose. It is suggested therefore that efforts be made to find a source of PG 58-16 asphalt binder, or even PG 58-10, and to use this in the alternative SPS-9A test section instead of the proposed PG 70-22.

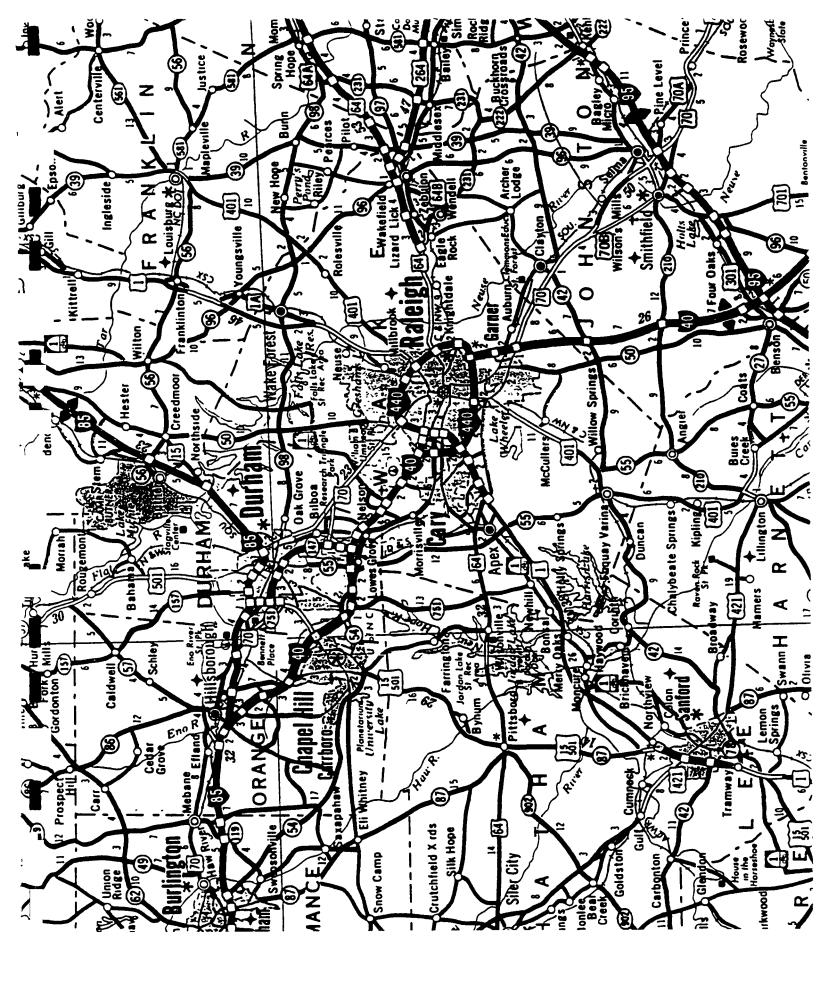
The PG 70-22 could be a polymer modified rather than straight-run binder, and the test section would be appropriate for monitoring as a supplemental test section.

Within the project length, it should certainly be possible to fit the test sections into segments that satisfy the other experiment criteria.

It is recommended that the project nomination be accepted as soon as possible so that contractual details can be worked out before the due dates.

CC: B. Abukhater

G. Cimini



LONG TERM PAVEMENT PERFORMANCE

North Atlantic Region

415 Lawrence Bell Drive, Unit 3, Amherst, New York 14221 Tel. (716) 631-5205 Fax (716) 632-0804



IVAN J. PECNIK, P.E. LTPP Regional Engineer



Mr. Patrick Strong
State Research Engineer
Pavement Management Section, Century Center
North Carolina Department of Transportation
P.O. Box 25201
Raleigh, North Carolina 27611

June 22, 1995

RE: SPS-9A Nomination; US1 N. of US15-501 to N. of SR1012 Lee and Chatham Co's. - Division 8, District 1 and 2

Dear Pat:

We have been advised that your nomination of the noted project for inclusion in the LTPP SPS-9A experiment has been approved.

Since North Carolina proposes the use of SHRP binder grades that are different from the environmental requirements at the site as called for in the experiment design, this project will not be eligible for incentive funds.

This Regional office will continue to be in contact with you and your staff concerning project details and co-ordination as those needs develop.

We are pleased and appreciative of North Carolina's active participation in this important LTPP experiment.

As always, this office remains available for discussion of any questions or concerns which you have.

Sincerely,

I.J. Peenik P.E.

LTPP Regional Engineer, NA

C.C. M. Biswas, NC DOT

Regional Administrator - FHWA Region 4 - Atlanta
Division Administrator - FHWA North Carolina Division

M. Symons, FHWA, LTPP

NARO



508 # 13-18.9

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

JAMES B. HUNT. JR. GOVERNOR DIVISION OF HIGHWAYS P.O. BOX 25201 RALEIGH. N.C. 27611-5201 R. SAMUEL HUNT III SECRETARY

August 14, 1995

MEMORANDUM TO:

File

FROM:

Mrinmay "Moy" Biswas

SUBJECT:

SHRP/LTPP/SPS-9A

Implementation of SUPERPAVE

Performance Grade Binders

NC-HIP # R2500A

After we received the approval (June 22, 1995) of our nomination for the SPS-9A project, William (Bill) Phang of Pavement Management Systems Limited (PMSL) sent us (July 27, 1995) two documents:

- 1. "Specific Pavement Studies Materials Sampling and Testing Requirements"
- 2. "Quality Control Plan Version No. 1"

I distributed copies of these documents to interested parties.

Today, I called Bill Phang to find out what he would need at this point. Bill said that he would need our project design plans and location of SPS-9A sections including beginning and ending stations. Upon receipt of this information, PMSL will generate project specific "Materials Sampling and Testing Plan."

When questioned about respective roles of NCDOT and PMSL, Bill stated the following:

Since NCDOT has SHRP-SUPERPAVE equipment, NCDOT should provide SUPERPAVE mix designs to the contractor.

NCDOT will take material samples before, during and after pavement construction and perform necessary tests. Material samples will include sub-base, base and pavement. Samples will include material components, mixes, formed specimens, and cores. Cores

(6 inch diam.) should be taken soon after placement of pavement (within one week) and at 6 months intervals for at least two years.

PMSL will have a person stationed at the site during construction and will provide oversight services regarding schedule and procedure for taking samples and testing.

NCDOT will provide all sampling and test data to PMSL. PMSL will generate a project specific "construction report."

When questioned about on site quality control, Bill said that the contractor should be able to produce asphalt concrete based on mix design specified by NCDOT. To ensure production of appropriate SUPERPAVE mix, the contractor should have "access" to a gyratory compactor, e.g. by way of a consulting service. For on site quality control, NCDOT should have an on site mobile facility. An FHWA trailer may be arranged but we cannot count on its availability at all the time when we would need it. It would be wise for NCDOT to acquire a gyratory compactor and ancillary equipment, e.g., an oven. Such equipment may be housed in trailer along with conventional quality control equipment, i.e., Marshall Testing, for standard mix.

The construction contract should include provisions for trial mixes which may be used to pave passing lanes.

Upon placement of pavement, NCDOT will install signs and markings for test sections. NCDOT will also install WIM (weigh in motion) and/or AVC (Automatic Vehicle Counter). Installation of WIM and/AVC should be included in the construction contract. As part of their "monitoring service" PMSL will measure pavement performance. Specifically, PMSL will perform FWD (Falling Weight Deflectometer) tests, run profilemeter, and take PASCO photographs (at night). NCDOT will provide traffic control for FWD.

These pavement performance tests will be performed for at least two year at intervals no more frequent than once a year. PMSL will only take measurements and collect data. PMSL will not evaluate data or write any report. PMSL will turn the data over to FHWA and to NCDOT. FHWA evaluation is likely to be generic including data from SPS-9A experiments of other SHAs. It would be up to NCDOT to evaluate state and project specific data and generate a report.

I reminded Bill that the NCDOT - R2500A project will include overlay on an existing roadway (South-bound) and new pavement (North-bound), primarily over mature fill. Our three SPS-9A sections are to be on the new roadway. We also intend to include at least two supplemental sections (e.g. SMA and Polymer Modified Asphalt) as overlays on the existing roadway. The latter two sections are not intended to be part of the SPS-9A.

Bill suggested that at the discretion of NCDOT, the overlay sections over existing roadway may also be included in the SPS-9A experiments. Under FHWA contract.

PMSL will collect pavement performance data for these sections as well. Should we choose to include overlay sections over existing pavement in the SPS-9A experiments, Bill suggested that we should consider including a standard mix and a SUPERPAVE mix.

To have the supplementary sections included in the SPS-9A experiments, NCDOT will need to have WIM and/or AVC installed. (In a later discussion, Jack Cowsert indicated that Pavement Management Unit may be interested in two alternative SMAs and two alternative Polymer modified asphalts, totaling up to six supplemental sections.)

Bill Phang will be available for consultation regarding planning for SPS-9A experiments and preparation of contract documents for R-2500A. A late September 1995 meeting date was suggested.

Whit Webb, P.E. cc: Fred Whitesell, P.E. Oscar (Buck) Clark, P.E. Ken Creech, P.E. Jack Cowsert, P.E. Dick Reaves, P.E. Cecil Jones. P.E. Jim Grady, P.E. Jim Trogdon, P.E. Charlie Casey, P.E. Scott Blevins, P.E. William A. Phang Monte Symons, P.E. (FHWA) Max Tate, P.E. (FHWA) Pat Strong, P.E.



STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

JAMES B. HUNT. JR. GOVERNOR

DIVISION OF HIGHWAYS P.O. BOX 25201. RALEIGH. N.C. 27611-5201 R. SAMUEL HUNT III
SECRETARY

August 17, 1995

Mr. William A. Phang
Program Manager
Pavement Management Systems Limited
415 Lawrence Bell Drive
Amherst, NY 14221

Dear Mr. Phang:

RE: SPS-9A, North Carolina

For your information, I am enclosing a set of plans of the R-2500A project which will include our SPS-9A experimental sections. The three main SPS-9A sections will be incorporated in the northbound new construction part of the project.

The planned locations of these three sections are as follows:

- Sta. 17+00 to Sta. 45+00 (2800 ft) Alternative PG 70-22 binder in SUPERPAVE mix
- 2. Sta. 45+00 to Sta. 73+00 (2800 ft) Conventional AC-20 binder in NCDOT Standard mix
- 3 Sta. 73+00 to Sta. 101+00 (2800 ft) Baseline PG 64-22 binder in SUPERPAVE mix

There will be 100 ft. transition lengths at both ends of each section, except that the transition length at the beginning of the second section will be 200 ft. This will allow us to avoid the possible effect of a railway trestle in this area. Thus, net lengths available for SPS-9A tests and evaluation will be 2600 ft, 2500 ft. and 2600 ft, respectively



Mr. William A. Phang Page 2 August 17, 1995

These sections will be constructed over relatively uniform mature fill and there will be entirely away from any rock formation. Grades will be fairly uniform ranging from -0.5% to +0.9% to -1.4%. Traffic will be fairly uniform.

I hope that this information will be sufficient for you to develop a project specific materials sampling and testing plan.

As you know, we were considering at least two supplementary sections (SMA and polymer modified asphalt) as overlays on existing asphalt concrete pavement which will become the southbound roadway of the project. At your suggestion, we are considering including supplementary sections as parts of the SPS-9A experiment, in which case we will also include one SUPERPAVE section and one standard mix section for comparative evaluation. We may also consider an alternative SMA and an alternative polymer modified asphalt. Thus, we may consider up to six supplementary sections for inclusion in the SPS-9A experiment.

We plan to finalize our decision on supplementary sections by the end of this month at which time I will inform you about their respective locations.

I hope that you will be available for consultation next month to assist us in finalizing the project contract documents.

Thank you.

Sincerely,

Mrinmay "Moy" Biswas, Ph.D., P.E.

Enclosure

cc: Whit Webb, P E.

Fred Whitesell, P.E.

Oscar (Buck) Clark, P E.

Jack Cowsert, P.E.

Dick Reaves, P.E.

Jim Grady, P E.

Scott Blevins, P.E.

Monte Symons, P E. (FHWA)

Max Tate, P E. (FHWA)



STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

JAMES B. HUNT. JR. GOVERNOR

DIVISION OF HIGHWAYS P.O. BOX 25201, RALEIGH, N.C. 27611-5201 R. SAMUEL HUNT III

September 1, 1995

Messrs. Oscar (Buck) Clark, P.E. MEMORANDUM TO:

Ken Creech, P.E. Jack Cowsert, P.E. Dick Reaves, P.E. Cecil Jones, P.E. Jim Grady, P.E. Scott Blevins. P.E. Jim Trogdon, P.E. Max Tate, P.E. (FHWA)

Pat Strong, P.E.

Mrinmay "Moy" Biswas FROM:

SHRP/LTPP/SPS-9A SUBJECT.

Implementation of SUPERPAVE Performance Grade Binders

NC-HIP = R2500A

To discuss the plans for SPS-9A SUPERPAVE implementation with Mr. Bill Phang of PMSL, a meeting will be held on Wednesday, September 27, 1995, beginning at 10.00 AM in the office of Division 8 in Aberdeen.

We invite you to attend this meeting.

Bill Phang (PMSL) cc:

Fred Whitesell. P E.

Whitmel Webb

Len Sanderson, P E.

Steve DeWitt, P.E.

Frank Pace, P E.

Charlie Casey, P.E.

Aiman Kuzmar, Ph. D.

Research North Carolle

JOB # 3 18 95

Research & Development Unit North Carolina Department of Transportation Division of Highways

FROM: Dr. Mrinmay (MOY) Biswas, P.E.

Room 506, Highway Building One South Wilmington Street

Post Office Box 25201
Raisigh, NC 27611-5201

Telephone: (919)715-2465

FAX: (919)715-0137

Facsimile Transmittal

To: Mr. William A. Phang

Pavement Management Systems Limited

FAX # (716) 632-4808

Phone # (716) 632-0804

DATE: Friday, September 15, 1995

NUMBER OF PAGES BEING TRANSMITTED [INCLUDING COVER SHEET]:

PROJECT

NCDOT SPS-9A SUBJECT: FIVE ADDITIONAL TEST SECTIONS

Message:

Besides the three North Bound lane new construction sections, we are proposing the following five additional sections as overlays on the existing south bound lane. Typical overly thickness is 2½ inch

1) Station 17+00 to Station 34+00 Baseline PG 64-22 binder in Superpave mix

2) Station 34+00 to Station 51+00. PG 58-22 binder modified with SBS polymer in Superpave mix

3) Station 51+00 to Station 68+00: Conventional AC-20 binder in NCDOT standard mix

4) Station 68+00 to Station 85+00. PG 58-22 binder modified with SBR polymer in Superpave mix

5) Station 85+00 to Station 102+00: Polymer modified binder and possible additives but no fibers in a Stone Mastic Asphalt mix.

Our agency preference remains for two 1½ inch thick lifts for all surface courses. In our September 27 meeting in Aberdeen, NC, we will remain open to discuss your suggestion of including at least three sections (new or overlay) to have 2½ thick single lift surface courses and designating these three sections as the primary SPS-9A sections and others as supplementary sections.

Thank you very much

cc. NCDOT Buck Clark, Ken Creech Jack Cowsert, Dick, Reaves, Cecil Jones, Jim Grady, Scott Bleving, Jim Trogdon, Charlie Casey, Whit Webb, Pat Strong, Aiman Kuzmar PCS/LAW: Gonzalo Rada, John Miller; FHWA, Max Tate, Monte Symons



JAMES B. HUNT JR. GOVERNOR

PO. BOX 25201. RALEIGH. N.C. 27611-5201

GARLAND B. GARRETT JR.
SECRETARY

September 21, 1995

MINUTES

SUBJECT SHRP/LTPP-SPS-9A

Implementation Superpave Performance Grade Binders

NC-TIP #R-2500A

TIME AND VENUE Meeting held on Tuesday, August 29, 1995, beginning at 9:30 AM in

the Traffic Engineering Conference Room, Century Center Building B

NOTES TAKENBY: Moy Biswas and Aiman Kuzmar

ATTENDEES: Buck Clark, P.E. Bill Medford

Fred Sykes
Ken Creech, P.E.
Jack Cowsert, P.E.
Dick Reaves, P.E.
Ted Jackson
Todd Whittington
Emad Khatib
Max Tate, P.E.

Cecil Jones, P.E. Pat Strong, P.E.

Carson Clippard. P.E. Moy Biswas, Ph.D., P.E. Aiman Kuzmar, Ph.D.

Summary of Discussions

TEST SECTIONS

Besides three sections on the north-bound new construction side, which were decided earlier, five more sections of overlay over the existing asphalt pavement of the south-bound side may be considered. These five sections can be included in the SPS-9A experiment. The pavement materials for these sections were suggested to be. 1) AC-20 binder and NC standard mix, 2) PG 64-22 binder and Superpave mix, 3) SBS polymer modified [PG 58-22] binder and Superpave mix, 4) SBR polymer modified [PG 58-22] binder and Superpave mix and 5) Polymer modified binder and Stone Mastic Asphalt (SMA) mix with additives but no fibers. The so called "Large-stone" mix will not be used. These five overlay test sections need not be as long as the test sections of the new construction side. These test sections need not be in any particular order.



TYPICAL SECTION

Referring to a transmittal from Bill Phang of the Pavement Management Systems, Ltd., Buck Clark noted that:

- 1) Regarding sub-grade, in stead of "cement" stabilized, it should be "lime" stabilized; and
- 2) Regarding the surface course, instead of a "single lift 2½ inch" thick surface course, we would use two lifts of 1½ inch thick each surface course.

TIME FRAMES

Mid-September, '95: PMU (Jack Cowsert) will provide locations and

design information regarding SPS-9A sections

to Design Services (Scott Blevins) and

Research and Development Unit (Moy Biswas).

Design Services will then forward the information to design consultants (TGS

Engineers)

Research and Development Unit will forward the information to SHRP/LTPP-North Atlantic Region Office, Pavement Management Systems

Ltd. (Bill Phang).

Mid-October, '95: Design consultants will complete contract

documents and make them ready for bid.

Late November, '95 Completion of specifications (later, see

comments on extended advertising period)

January 16, 1996: Letting date

March, 1996 Start of project construction

Fall, 1996 Start of pavement construction

Construction of the new (north-bound) roadway and pavement will start first while traffic will continue on the existing highway. Upon completion of construction of the new pavement, traffic will be switched over to the newly constructed side and overlay work on existing pavement will start.

To assure a relatively uniform ambient temperature condition for placement of all test sections [only], the exclusionary time period for construction may be expanded from the beginning of November through mid-March, with the exception of a sequence of warm days during that period. This requirement should be included in the "Special Provisions" of the project specifications. This may put the actual construction time for the surface course of the new pavement test sections in Spring, 1997.

UNITS: SI (METRIC) OR US CUSTOMARY (ENGLISH)? The project is in US Customary units and will be exempt from the NCDOT requirements of metric conversion. For the SPS-9A experiment, we will maintain "hard" units as they would fall per prevailing convention. For example, for pavement section station locations, lengths, widths and thicknesses, etc., US Customary units will be used; and for SHRP-Superpave tests for binders, aggregates and mixes, SI units will used. "Soft" conversions will be avoided.

DATA ANALYSIS

PMSL will perform pavement monitoring tests and forward test data to the FHWA and to the NCDOT for subsequent data analysis. Inclusion of each additional supplementary test section will create additional demand on our analysis and reporting resources.

Ken Creech stated that for a period of at least five years after the completion of respective test sections, his Pavement Management Unit will run parallel pavement monitoring tests for primary as well as all supplementary sections and analyze all test data generated by PMU as well as those generated by PMSL.

FIELD TRIPS

- 1) North Carolina (R-2500A) Site: It would not be necessary to have an organized field trip to the site. Individual parties may choose to visit the site on their own.
- 2) Ohio site: Ohio is scheduled to lay down SPS 9-A pavement in the near future. Observing such an operation would be beneficial for us. However, out state travel restrictions may not allow us to organize such a group field trip. Biswas will provide Ohio contact information, should individuals choose to arrange a trip. (For Ohio contact information, see later part of this document.)

ASPHALT
MATERIAL FOR
PRELIMINARY
TESTING

Ivan Parra of CITGO Asphalt Refinery has assured Moy Biswas, that besides PG 64-22 binder, straight run PG 70-22 material will be available for the project out of their Wilmington or Savannah refineries. For the purpose of preliminary binder testing by Bill Medford's section as well as preliminary mix design by Carson Clippard's section, Moy Biswas will request CITGO to send some sample of AC materials to NCDOT. For each type of AC material, Bill will need 1 quart and Carson will need 5 gallons. Jack Cowsert will give preliminary estimate of asphalt cement materials that will be needed for the test sections of the project to Moy Biswas. Biswas may need to provide this information to CITGO. (For preliminary estimate of material quantities, see later part of this document)

Buck Clark asked if NCDOT would provide PG graded asphalt binders to the contractor or if the contractor would obtain the material. Biswas explained that the purpose of our contact with CITGO was to assure the feasibility of obtaining [by contractor] the material that we specify

FIELD QUALITY
CONTROL AND
EQUIPMENT

For the R-2500A project, Division 8 will use the forthcoming Quality Management System (QMS). Under QMS, NCDOT will perform random quality assurance procedures including limited field testing. Division 8 will need SHRP Superpave specific testing equipment, such as a gyratory compactor and ancillary equipment such as a large oven. These equipment will be housed in a facility at the Division 8 office in Aberdeen. There will be no NCDOT testing laboratory at the site per se and acquisition of a trailer will not be necessary.

However, the FHWA SHRP-Superpave trailer being available at the site will be useful.

LABORATORY
OUALITY CONTROL
AND EQUIPMENT

SHRP-Superpave testing equipment acquired through pooled fund will be used for evaluation of binders and mixes. The Bending Beam Rhemoter (BBR) has not functioned entirely satisfactorily and may not be reliable at the time of the project construction. It was suggested that a more reliable BBR should be acquired.

FIELD MONITORING EQUIPMENT

Weigh in Motion (WIM) and Automated Vehicle Counter (AVC) and other instruments will be required. Placement of in pavement instrumentation should be included in the project contract and schedule of installation will need to be coordinated with pavement placement. Because of the presence of US weather station at Moncure nearby, it would not be necessary to install a weather station at the site.

EQUIPMENT ACQUISITION

M&T (Cecil Jones) will generate a shopping list of Superpave testing equipment. R&D (Pat Strong) will get information on WIM-AVC equipment. Bill Phang will give us a listing of pavement monitoring instruments.

Some of this equipment may be acquired through the project fund and some through Research and Development funds.

DISPOSITION OF EXCESS ASPHALT CONCRETE MATERIALS Potentially, there could be 6 different mixes in the project. Each of these mixes will have some excess. Additionally, there will be remains from trial mixes. Excess mixes may be utilized either in construction of shoulders or may be placed in passing (left hand side) lanes.

BID \DVERTISEME\T

Since potential contractors are not entirely familiar with SHRP-Superpave technology, for the purpose of getting good competitive bids, it would be appropriate to have an extended advertising period.

MEETING WITH BILL PHANG

It would be worthwhile to have Bill Phang come down for a planning meeting in the near future, preferably by the last week of September, '95. The next meeting could be held at the Div 8 office in Aberdeen.

This will give the participants an opportunity to drive over the project site.

FUTURE MEETINGS

Bill Phang would be available for a pre-bid meeting as well as for a pre-construction meeting.

For future meetings in general, to discuss planning for SPS 9-A, Dick Reaves offered that the M&T conference room would be available.

TRAINING & ASSISTANCE

- 1) Division personnel will need training in performing SHRP-Superpave quality assurance tests.
- 2) Division and M&T personnel will appreciate receiving training and assistance that may be available through FHWA regarding (a) developing Superpave mix design, (b) review of material mix design, (c) mixture verification and quality control, and (d) other.

INCENTIVE SSS

Current FHWA approval of the NCDOT SPS-9A is without any incentive money. The Research & Development Unit will generate a letter requesting reconsideration to provide incentive. Max Tate of the FHWA NC Division will forward the letter to the FHWA Headquarters. Bases for request for reinstatement of incentive would be: 1) Design basis traffic is 166,000 ESAL/year which is substantively higher that the required minimum of 50,000 ESAL/year, 2) Inclusion of 5 supplementary sections including additional specialty binders and mix type, 3) Inclusion of both new pavement and overlay, 4) SHA acquiring additional equipment beyond pooled fund purchase for laboratory as well as field quality control.

Follow Up Discussions and Activities:

1) ESTIMATED QUANTITIES:

Jack Cowsert provided the following estimate of materials

New Construction:

Base course asphalt concrete: 1500 tons / 2800 ft section Binder course asphalt concrete: 1300 tons / 2800 ft section Surface course asphalt concrete: 1000 tons / 2800 ft section

SHRP PG 64-22 AC binder: 185 tons for one 2800 ft Superpave section SHRP PG 70-22 AC binder: 185 tons for one 2800 ft Superpave section

Overlay Construction:

2½ inch overlay asphalt concrete: 650 tons / 1700 ft section

SHRP PG 64-22 binder: 36 tons for one 1700 ft Superpave section Specialty binders: 36 tons for each 1700 ft Superpave section

2) LOCATION OF OVERLAY TEST SECTIONS AND "WEDGING"

Jack Cowsert and Moy Biswas discussed about sequence and location of different overlay test sections. This information was later forwarded to Bill Phang with cc: to NCDOT and FHWA personnel. Later, Design Services informed Jack that to eliminate roughness in the existing pavement, there would be a considerable amount of wedging. This would make the overlay considerably thicker than 2½ in many locations and also the overlay thickness would be considerably varying. Considerably varying overlay thickness will not allow satisfactory evaluation of SPS-9A tests. Pat Strong and Moy Biswas obtained "Straight Line Diagrams" from GIS and forwarded copies to Buck Clark and Jack Cowsert. Moy Biswas also called Buck Clark to alert him about potential wedging requirement. This information came to Buck as a surprise. (Moy Biswas will have copies of the straight line diagrams available at the next SPS-9A planning meeting to be held on September 27, 1995, in Aberdeen.)

3) SINGLE LIFT 21/2 INCH THICK SURFACE COURSE AND OVERLAY:

Moy Biswas informed Bill Phang that the agency preference is for two lifts of 11/4 inch thick surface courses. Bill Phang informed Moy Biswas that the single 21/2 inch layer is required to prepare 2 inch thick specimens that will be used in the SST (Superpave Shear Testing) device. Not having a single lift surface layer will preclude us from having SST performed. Moy Biswas' conversations with Jim Trogdon and Jim Grady indicated that constructing a single 2½ inch thick lift is "do-able." Moy Biswas had a series of follow up discussions involving a number of people, including Gonzalo Rada and John Miller of PCS/Law, Larry Scoffield of Arizona DOT, Roger Green (614-752-5277) of Ohio DOT, and Pat Strong, Jack Cowsert, Jim Grady and Carson Clippard of NCDOT. Although a number of states have placed Superpave type pavements, and a number of states are in the "pipe line" for placing SPS-9A, Anzona is the only state that has installed SPS-9A pavement sections. Not all the states that are in the pipeline have committed to single 21/2 inch thick lift surface course. Ohio has completed design and specifications and plans to install SPS-9A sections in the near future. Ohio will have a single 134 inch thick lift surface course, with the understanding that SST can be performed on 1½ inch thick specimens. The latter, however, was not confirmed by either John Miller or Bill Phang. What is understood is that Superpave mix lays down very nicely and potential lack of compaction is not a problem. There are, however, two potential problems: 1) asphalt concrete plant production rate may not be rapid enough and/or there may not be enough trucks available to feed the paver at a sufficient rate and 2) it may be difficult to control the screed. One or both of the two situations may result in a rough pavement surface.

Minutes issued by Dr. Minmay "Moy" Biswas, P.E.

cc: Attendees

Fred Whitesell, P E

Whit Webb

Charite Casey, P E.

Scott Blevins, P.E. Jim Trogdon, P.E.

Monte Symons, P E. (FHWA)

Bill Phang (PMSL)

Gonzalo Rada, Ph. D., P E. (PCS/Law)

John Miller, P E. (PCS/Law)

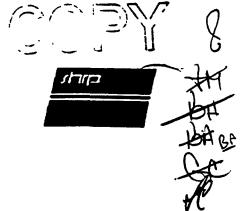
LONG TERM PAVEMENT PERFORMANCE

North Atlantic Region

415 Lawrence Bell Drive, Unit 3, Amherst, New York 14221 Tel. (716) 631-5205 Fax (716) 632-0804



IVAN J. PECNIK, P.E. LTPP Regional Engineer



MEMORANDUM

TO: Monte Symons - FHWA - McLean

FROM: I.J. Pecnik P.E.

LTPP Regional Engineer, NA

DATE: October 3, 1995

SUBJECT: SPS-9A Project, US-1, Sanford, NC - Supplemental Sections

COPIES TO: M. Biswas, NC DOT

Reg. Administrator, FHWA - Region 4, Atlanta Div. Administrator, FHWA - NC Division

Div. Administrator, FHWA - NC Division

NARO

This is to bring you up to date on recent developments in the SPS-9A project on US-1, Sanford, NC that was approved last June.

The initial nomination was for 3 test sections for new construction in the Northbound lanes of US-1. The 3 test sections conformed to the experiment design except that a PG 70-22 was utilized as the alternative Superpave mix binder instead of a PG 58-22 for testing rutting. The Superpave binder is a PG 64-22, and the NC DOT standard mix uses an AC-20.

North Carolina DOT now intends to construct 5 supplemental sections in the overlay for the existing pavement which will be the Southbound lanes. These supplemental sections include a NC standard mix with AC-20, Superpave with PG 64-22, and Superpave mixes with PG 58-22 with SBR and SBS modification. There will also be an SMA with PG 58-22 and Vestoplast additive.

Incentive funds were withheld in the initial SPS-9A approval. In light of these new initiatives by North Carolina DOT, we request that the original incentive fund determination be reviewed and that these funds now be made available for the NC SPS-9A project, being in the best interests of the goals of the experiment.

PROBABLE SPS-9A SECTIONS BINDER STUDY

New Construction: (North-bound)

9 inch Asphalt pavement over LIME stabilized subgrade

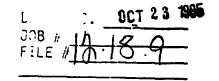
1. AC-20 binder and NC Standard mix:	2800 ft section
2. SHRP PG 64-22 AC binder and Superpave mix:	2800 ft section
3. SHRP PG 70-22 AC binder and Superpave mix:	2800 ft section

Overlay Construction over existing roadway: (South-bound)

21/2 thick overlay over existing asphalt pavement

4. AC-20 binder and NC Standard mix:	1700 ft section
5. SHRP PG 64-22 binder and Superpave mix:	1700 ft section
6. SHRP PG 58-22 + SBR modified binder and Superpave mix:	1700 ft section
7. SHRP PG 58-22 + SBS modified binder and Superpave mix:	1700 ft section
8. ?SHRP PG 58-22 + polymer modified binder and SMA mix:	1700 ft section





James B. Hunt Jr. Governor

P.O. BOX 25201, RALEIGH, N.C. 27611-5201

GARLAND B. GARRETT JR.
SECRETARY

Memorandum

DATE: October 16, 1995

TO: Oscar (Buck) Clark, P.E. FAX: 8-(910) 944-5623

Fred Sykes FAX: 8-(919) 776-7379

Dick Reaves, P.E.

Cecil Jones, P.E.

Carson Clippard, P. E.

Bill Medford

Ted Jackson

Judith Corley-Lay, Ph D, P E.

FAX: 3-8742

FAX: 3-8742

FAX: 3-8742

FAX: 3-8742

FAX: 3-8742

FAX: 3-8742

 Judith Corley-Lay, Ph D , P E.
 FAX: 9-250-4098

 Jack Cowsert, P E.
 FAX: 9-250-4098

 Jim Grady, P.E.
 FAX: 3-8441

 Jim Trogdon, P E.
 FAX: 3-1838

 Whit Webb
 FAX: 3-3585

 Scott Blevins, P E.
 FAX: 9-250-4119

Bill Phang, Ph.D. (PMSL)

Max Tate, P E. (FHWA)

FAX: 9-250-4119

FAX: 8-(716) 632-4808

FAX: 9-856-4353

Pat Strong, P.E. Alman Kuzmar, Ph. D.

FROM: Moy Biswas, Ph D., P E

Phone (919) 715-2465 FAX (919) 715-0137

RE: R-2500A/SPS-9A. Revised Plans for

Binders, Mixes and Sections

cc: Larry Goode, Ph. D., P. E.

Don Goins, P E
Calvin Leggett, P E.
C. A. Gardner, P E.
Fred Whitesell, P E.
Len Sanderson, P E.
Steve DeWitt, P E.
Randy Pace, P E.
Ken Creech, P E
Charlie Casey, P E.

Monte Symons, P E. (FHWA)

Gonzalo Rada, Ph D, P E. (PCS/Law)

John Miller, P E (PCS/Law)

To discuss specifications for polymer modified asphalt cement (PMAC), Dr. Judith Corley-Lay called a meeting. The meeting was held on Friday, October 13, 1995. The meeting was attended by Dr. Judith Corley-Lay, Jack Cowsert, Carson Clippard, Jim Grady and Moy Biswas. Because of an immediate need for specification for PMAC for the R-2500-A/SPS-9A project and because of the potential impact of SPS-9A project on future pavement applications, the following tentative plan for binders, mixes and sections were adopted.

New Construction: (North-bound)

9 inch thick asphalt pavement over lime stabilized subgrade

1. AC-20 binder and NC Standard mix:	2800 ft section
2. SHRP PG 64-22 AC binder and SUPERPAVE® mix:	2800 ft section
3. SHRP PG 70-22 AC binder and SUPERPAVE® mix:	2800 ft section

Overlay Construction over existing roadway: (South-bound)

2½ inch thick overlay over existing asphalt pavement

4. AC-20 binder and NC Standard mix:	1400 ft section
5. SHRP PG 70-22 binder and SUPERPAVE mix:	1400 ft section
6. SHRP PG 76-22 Random Styrene Butadiene Co-polymer ^(a)	
Modified binder and SUPERPAVE [®] mix:	1400 ft section
7. SHRP PG 76-22 Block Styrene Butadiene Co-polymer ^(b)	
Modified binder and SUPERPAVE® mix:	1400 ft section
8. SHRP PG 76-22 multi-grade binder and SUPERPAVE® mix:	1400 ft section
9. SHRP PG 76-22 binder (contractor to choose any one of	
above three binders and any additive and/or fiber, keeping	
within the drain-down requirements) and SMA mix:	1400 ft section

- (a) Random Styrene Butadiene Co-polymer is also known as SBR-Latex. In the east coast region, due to the market situation, this type of product is usually injected at the plant.
- (b) <u>Block</u> Styrene Butadiene Co-polymer can be a Tri-Block product (e.g. SBS) or a Di-Block product (e.g. Styrelf). This type of product is usually pre-blended at the terminal.

NOTE: No binders will be air-blown

This plan will allow us to evaluate comparative performance of different performance graded binders vis-à-vis a conventionally graded binder, different polymer modifications vis-à-vis multi-grade binder, as well as different asphalt concrete mixes including conventional mix, stone-mastic asphalt mix and SUPERPAVE mix.

If you have a comment on this plan, please contact me immediately

COPY



APR 2 4 1996

FILE # 3. 8.9

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

JAMES B. HUNT JR. GOVERNOR

P.O. BOX 25201. RALEIGH. N.C. 27611-5201

GARLAND B. GARRETT JR.
SECRETARY

TUESDAY, APRIL 16, 1996

MINUTES

SUBJECT: SHRP-Superpave Implementation

OBJECTIVES: To set goals for implementation in NCDOT pavement projects

ATTENDANCE: Cecil Jones (Convener), Jim Grady, Jack Cowsert,

Jim Travis (FHWA), Pat Strong, and Moy Biswas

DAY, DATE, TIME Monday,

Monday, April 15, 1996: 9:30 AM

PLACE:

Construction Conference Room

Minutes prepared by:

Mov Biswas

cc: Attendees, and Larry Goode. Don Goins, Berry Jenkins, Len Sanderson,

Dick Reaves, Steve DeWitt, Ken Creech and Max Tate (FHWA)

In the context of the national goal of fully implementing the Superpave technology by the year 2000 and a recently stated SEAUPG (Southeast Asphalt User Producer Group) goal of initiating utilization of Superpave by 1997, Cecil Jones stated the need for establishing some preliminary goals and target schedules for implementation of Superpave technology in NCDOT projects, besides the forthcoming SHRP-LTPP SPS-9A experiment on US 1, R-2500A (6.549001T) project in Chatham and Lee Counties.

The discussions were under two subjects headings: (1) PG Binders

(2) Superpave Mix.

A summary of discussions and action items are as follows:

PG BINDERS

Jim Grady has identified a current I-95 project in Halifax County which calls for AC-30 binder. The project consists of rubbleizing existing concrete pavement and overlaying of full depth asphalt concrete pavement. The contractor (Adams Construction) has indicated his willingness to switch to binder designation PG 76-22 for the whole length of the project. Moy Biswas stated that PG 76-22 is likely to be a modified binder and may not be warranted for the project requiring AC-30; a straight run PG 70-22 binder might do.

(over →)



Moy Biswas also stated that, in general, at the low temperature end, -22° C can be used when -16° C is called for.

- Jack Cowsert will check into the PG binder grade requirement for the subject project and let Jim Grady know.
- Jim Grady will contact Adams Construction regarding possible use of PG binder for the project.

Since the actual asphalt binder is likely to be the same with only a change in grade labeling, Jim is optimistic that the use of PG binder will not affect the potential increase in the cost of the project in any significant way.

- Jack Cowsert will look into the pavement projects that will be coming up in the near
 future throughout the state and estimate the actual ranges of PG binders that may be
 required at different parts of the state.
- Jim Travis will make a recently issued SHRP computer program available to Jack Cowsert.

It was noted that at critical locations, appropriate modifiers can be utilized, which would be no different from what is current practice.

A significant amount of SHRP testing for PG binders, including modified binders has been conducted by the M&T lab.

• Cecil Jones will distribute the information on the PG test results obtained for different binders tested.

Question was raised if performance of higher PG binder, e.g. 76-22, would be the same regardless of how the higher grade is obtained, e.g. by the use of polymer modifiers or by being air-blown. This question remains unanswered. It was stated that the Maryland DOT has experienced some difficulty in using air-blown asphalt binder. Jack Cowsert said that he would contact Maryland to find out about any problem they might have experienced regarding implementation of Superpave (binder and mix) especially regarding the use of air-blown asphalt. In consideration of uncertainty regarding the use of air-blown asphalt binder, we have excluded the same from being used in the SPS-9A project.

SUPERPAVE MIX

Jim Grady stated that in a recent Joint NCDOT/CAPA meeting, contractors in general expressed their willingness to embrace Superpave technology. Pavement contractors in North Carolina do not have gyratory compactors and they are not experienced in Superpave mix design. At least one aggregate supplier has a gyratory compactor and has the Superpave mix design capability and is likely to participate in the development of NCDOT Superpave mix design. To initiate implementation of Superpave mix design, the following courses of action should be taken:

 $(over \rightarrow)$

- Jim Grady will solicit prospective contractors to "volunteer" to incorporate Superpave section[s], each approximately one-half mile long, in upcoming projects.
- M&T will do the mix design. Mix design by M&T will require confirmation by an outside agency.
- Cecil Jones will contact Ray Brown of NCAT (National Center for Asphalt Technology at Auburn University) to have the paper-work completed (tie the knot) regarding NCDOT's contribution to the regional pooled fund to support NCAT as the regional Superpave center.

Moy Biswas commented that the performance of test sections should be evaluated. As experimental features, one test section may have a 2 ½ inch thick single lift surface course and another test section two lift, 1¼ inch thick each surface course. Moy Biswas also suggested that initially, the PG 64-22 binder based mix design should be used. Such mix should be relatively easy to lay down.

- R&D Unit will provide for necessary funding arrangements for mix design confirmation work to be performed by NCAT.
- R&D Unit will provide for necessary funding arrangements for [mix] performance tests to be performed by NCAT during the evaluation phase.
- R&D Unit will budget for acquisition of two additional gyratory compactors to be used for Superpave implementation.
- M&T Unit will coordinate for mix design confirmation work to be performed by NCAT.
- M&T Unit will coordinate for [mix] performance tests to be performed by NCAT during the evaluation phase.
- M&T and PMU will arrange for evaluation testing that will be done by their respective personnel and equipment.
- R&D Unit will budget for additional in-house evaluation effort that may be necessary.

The use of a Georgia wheel tester type device for performance evaluation of pavement was discussed. Cecil Jones will continue to pursue this subject with certain FHWA headquarters personnel, especially regarding acquisition of such a device.

The subject of the "restricted zone" for aggregates was discussed. Because of uncertainty in this area, the "restricted zone" requirement will be complied with. It would be worthwhile to study, as a research project, to investigate the exclusion zone provision for North Carolina aggregates.

(over \rightarrow)

SUMMARY OF ACTION ITEMS

FHWA

• Jim Travis will make a recently issued SHRP computer program available to Jack Cowsert.

PMU

- Jack Cowsert will contact the Maryland DOT to find out about any problem they might have experienced regarding implementation of Superpave (binder and mix), especially regarding the use of air-blown asphalt.
- Jack Cowsert will check into the PG binder grade requirement for the subject project (I-95, Halifax County) and let Jim Grady know.
- Jack Cowsert will look into the pavement projects that will be coming up in the near future throughout the state and estimate the actual ranges of PG binders that may be required at different parts of the state.
- PMU will arrange for evaluation testing that will be done by its personnel and equipment.

CONSTRUCTION

- Jim Grady will contact the contractor regarding possible use of PG binder for the project.
- Jim Grady will solicit prospective contractors to "volunteer" to incorporate Superpave section[s], each approximately one-half mile long, in upcoming projects.

M&T

- Cecil Jones will distribute the information on PG obtained for different binders tested.
- M&T will do the mix design. Mix design by M&T will require confirmation by an outside agency.
- Cecil Jones will contact Ray Brown of NCAT to have the paper-work completed (tie the knot) regarding NCDOT's contribution to the regional pooled fund to support NCAT as the regional Superpave center.
- M&T Unit will coordinate for mix design confirmation work to be performed by NCAT.
- M&T Unit will coordinate for [mix] performance tests to be performed by NCAT during the evaluation phase.
- M&T will arrange for evaluation testing that will be done by its personnel and equipment.

<u>R&D</u>

- R&D Unit will provide for necessary funding arrangements for mix design confirmation work to be performed by NCAT.
- R&D Unit will provide for necessary funding arrangements for [mix] performance tests to be performed by NCAT during the evaluation phase.
- R&D Unit will budget for acquisition of two additional gyratory compactors to be used for Superpave implementation.
- R&D Unit will budget for additional in-house evaluation effort that may be necessary
- R&D Unit will consider initiating a research project to investigate the restricted zone provision for North Carolina aggregates.



June 20, 1996 50451110-13.18.9

Dr. Mrinmay "Moy" Biswas
Pavement and Materials Research Engineer
North Carolina Department of Transportation
Division of Highways
P.O. Box 25201
Raleigh, North Carolina 27611-5201

RE: SPS-9A, Superpave Regional Test Center

Dear Dr. Biswas:

We at the NA Regional Coordination Office were pleased that you were able to visit our offices on June 18, 1996.

You indicated during our discussions that the NC DOT intended to use the NCAT Superpave Regional Test Center to carry out the performance testing of the Superpave surface course and binder course mixes.

It was suggested that you use the tracking table 19 from the April 1996 version of the Materials Sampling and Testing Plans for the SPS-9A project, US-1, Sanford, NC to get from NCAT an estimate of testing costs for budgeting purposes.

A copy of Tables 9, 19 and 24 are enclosed for your convenience.

Please keep us informed of your progress in arranging with FHWA (John Bukowski) for on-site Superpave mix design training of DOT and Contractor staff.

Yours Sincerely,

William A. Phang Principal Investigator

Pavement Management Systems Limited

William A Item

WAP/tf

enclosure

C C I J Pecnik, P E RE NARO, w/o enclosure B Abukhater, NARO, w/enclosure E. Lesswing, NARO, w/o enclosure A. Lopez, FHWA-LTPP w/o enclosure



Post-il" Fax Note

Fax = (9/9) 733-8441

5315 ROCKY FORK CHURCH ROAD

POST OFFICE DRAWER 1109 SANFORD, NORTH CAROLINA 27331-1109 PHONE 519-775-4338 FAX 919-774-1569

January 24, 1997

7671

YOUR INFO.

Phone #

Mr. Fred Sykes, Resident Engineer N C Department of Transportation Division of Highways

P O Box 429
-- Sanford, - North Carolina 27321.

Re: Project No..6.549001T

Lee/Chatham Counties

Subject: Superpave

Project Special Provisions

Quality Management Systems for Asphalt

Pavements Page No. 21, Modification No. 2

Dear Mr. Sykes.

In reference to the above referenced project and subject, Lee Paving Company is anxious to get started with the training in Superpave mix design and quality control procedures as set forth in the contract. We have set our schedule to start this part of the paving by April 15, 1997. We would appreciate your help in scheduling and expediting this part of the contract.

Thank you for your cooperation in this matter.

Sincerely,

TEE BYAING COMBYNA

Larry C. Oldham Vice-President

LCO/alh

JAN 2 / 1997

DIVISION 8

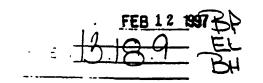
DIVISION OF HIGHWAYS

RESIDENT ENGINEER









JAMES B. HUNT JR. GOVERNOR DIVISION OF HIGHWAYS P.O. BOX 25201, RALEIGH, N.C. 27611-5201 GARLAND B. GARRETT JR.
SECRETARY

FACSIMILE MEMORANDUM

2 PAGES

CONFIRMATION COPY WILL FOLLOW

DATE: JANUARY 31, 1997

To:

MAX TATE (FHWA/RALEIGH-RESEARCH)

FAX: 9-856-4353

FROM:

DR. MRINMAY (MOY) BISWAS, P.E. MOY

PHN: (919) 715-2465

RESEARCH & DEVELOPMENT UNIT

FAX: (919) 715-0137

One South Wilmington St. RM 506

EML: biswas@swp.dot.state.nc.us

PROJECT:

6.549001T/R-2500A (SPS-9A)

SUBJECT:

SUPERPAVE TM TEST SECTION CONSTRUCTION SCHEDULE AND

SCHEDULING OF FHWA SUPERPAVETM DEMONSTRATION TRAILER

Message:

This is in response to your facsimile transmission of January 27, 1997, expressing the concern of you and Jim Travis regarding the prospective schedule of construction of Superpave™ test sections and scheduling of the FHWA Superpave™ demonstration trailer.

By way of a letter (copy attached) to Mr. Fred Sykes, Resident Engineer, Lee County, Lee Paving Company, the project contractor has indicated that he plans to start construction of test sections by April 15, 1997. Also, Mr. Jim Grady informed me that the contractor has selected an aggregate supplier (Martin Marietta-Lemon Spring Quarry) and have two of his personnel enrolled in Superpave™ mix design schools scheduled for early February, 1997

Regarding scheduling the FHWA demonstration trailer, I believe that a schedule window of May 15 through June 15, 1997 should be appropriate.

encl

cc: Larry Goode, Ph. D., P. E.

Don Goins, P E. C. A Gardner, P E Berry Jenkins, P E Bill Rosser, P E Tim Johnson, P E

Lex Kelly, P E Fred Sykes

Whitmel Webb, P.E. Len Sanderson, P.E. Steve DeWitt, P.E.

Jim Grady, P E.

Ken Creech, P E
Jack Cowsert, P E.
Dick Reaves, P E.
Cecil Jones, P E.
Carson Clippard, P E.

Bill Medford

Jim Trogdon, P.E. Pat Strong, P.E.

John Bukowski (FHWA-H q) Jim Travis (FHWA-Raleigh)

Ivan Pecnik, P E., (FHWA/LTPP-NARO)

Bill Phang Ph D, (ITX/Stanley)



lames B. Hunt Ir. GOVERNOR

DIVISION OF HIGHWAYS PO BOX 25201 RALEIGH NC 27611-5201 GARLAND B GARRETT JR. SECRETARY

Memorandum

DATE:

March 28, 1997

TO:

Division Engineers

FROM:

Dr. Mrinmay (Moy) Biswas, P E 7 PHN. (919) 715-2465

Research & Development Unit

FAX. (919) 715-0137

EML: biswas@swp dot.state nc.us

SUB:

CHANGE OF VENUE AND STARTING TIME

RE:

SUPERPAVE MIX DESIGN NCDOT TRAINING SCHOOL

APRIL 15, 16 AND 17, 1997 ABERDEEN, NORTH CAROLINA

CC:

Don Goins, P E

Berry Jenkins, P.E.

C A Gardner, P. E.

Division Construction Engineers

Division Maintenance Engineers

Len Sanderson, P E

Steve DeWitt, P E

Jim Grady, P E.

Dick Reaves, P.E.

Cecil Jones, P.E. Frank Pace, P E

Fred Sykes

Earl Ellenburg

Christee B Barbee (CAPA)

Ken Creech, P.E.

Jack Cowsert, P E

Carson Clippard, P. E.

Bill Medford

Jim Trogdon, P.E.

Pat Strong, P E

Doug Hanson (NCAT)

John Bukowski (FHWA-H.Q.)

Monte Symons, P E. (FHWA-H Q) Max Tate, P.E. (FHWA-Raleigh)

Jim Travis (FHWA-Raleigh)

Ivan Pecnik, P E. (FHWA/LTPP-NARO)

Bill Phang Ph.D. (ITX/Stanley)

Basel Abukhater (ITX/Stanley)

On Tuesday, April 15, the Executive sessions will be held at the Sandhills Community College in Pinehurst The Registration will start 9:15 AM and lectures will start 10.00 AM

The auditorium at the Sandhills Community College has a larger capacity to accommodate a large number of attendees from throughout the State that we anticipate. The earlier starting time will allow us to cover the SUPERPAVE "Binder" as well "Mix Design" topics adequately and also to provide ample time for questions, answers and discussions.

For the convenience of attendees, we are now planning to provide a light lunch and midafternoon refreshments. We will provide you with more details on this later.

I am enclosing the Program for the Tuesday, April 15 Executive Sessions (Pinehurst) as well as the Program for the hands-on laboratory/lecture sessions on Wednesday and Thursday, April 16 and 17 (Aberdeen and Southern Pines).

All participants will receive a FHWA Superpave Mix Design Manual.

Tuesday sessions are open to supervisory administrative personnel as well as to those who will attend the Wednesday and Thursday Hands-on sessions If you and your people have not signed up already, please do so ASAP. I am enclosing a return FAX form. This will allow us to arrange the meeting room seating adequately as well as to plan for food services.



NCDOT SUPERPAVE Mix Design School

OVERVIEW LECTURES

Tuesday, April 15, 1997

Sandhills Community College, Pinehurst, NC

Instructor: Doug Hanson (National Center for Asphalt Technology)

9:15 to 10.00	Registration and Distribution of Manual
10:00 to 10:05	Opening Comments (Pat Strong)
10.05 to 10:20	What and Why SUPERPAVE?
10:20 to 11:10	SUPERPAVE Binder Testing and Specifications
11:10 to 11.20	Questions
11:20 to 11:40	Views of Asphalt Binder Suppliers (Citgo, Ivan Parra)
11:40 to 11.50	Status of SUPERPAVE Binder Specifications in North Carolina (Cecil Jones)
11:50 to Noon	Questions
Noon to 1 00	Lunch Break
1.00 to 1 10	Questions on Morning Sessions
1 10 to 1 40	SUPERPAVE Aggregate Testing and Requirements
1 40 to 2 00	Views of Aggregate Suppliers (Martin Marietta, Sam Johnson)
2.00 to 2 10	Questions
2.10 to 2 55	Laboratory Compaction & Mix Design Process
2.55 to 3 05	Questions
3 05 to 3 25	Break
3 25 to 3 55	Performance Testing (SUPERPAVE testing vs. Loaded Wheel Rut Testing)
3 55 to 4 25	Construction Issues
4 25 to 4 40	Status of SUPERPAVE Construction on North Carolina (Jim Grady)
4 40 to 5 00	Questions

NCDOT SUPERPAVE Mix Design School

Wednesday, April 16 and Thursday, April 17, 1997

Laboratory Sessions: Div. 8, QA Lab, Aberdeen, NC 5
Lecture Sessions: DAYS INN Conference Room, Southern Pines, US 1

Instructors: Doug Hanson and others (National Center for Asphalt Technology)

	Wednesday, April 16, 1997		Thursday, A	pril 17, 1997
	Group A	Group B	Group A	Group B
8:00 to 9:50	LAB (1) Aggregate Testing	LECTURE (1) Detailed Overview of Superpave Mix Design Process	LAB (3) TSR/Rice	LECTURE (3) SGC Calculations
9:50 to 10:10	Shu	TTLE	SHUTTLE	
10.10 to Noon	LECTURE (1) Detailed Overview of Superpave Mix Design Process	LAB (1) Aggregate Testing	LECTURE (3) SGC Calculations	LAB(4) Hands on with SGC
Noon to 1.00	lunch		Lus	nch
1 00 to 2.50	LAB (2) Introduction to Superpave Gyratory Compactor (SGC)	LECTURE (2) Volumetrics	LAB (4) Hands on with SGC	LECTURE (4) Mix Design Example
2 50 to 3 10	SHUTTLE		Sни	TLE
3 10 to 500	LECTURE (2) Volumetrics	LAB(2) Introduction to Superpave Gyratory Compactor (SGC)	Lecture (4) Mix Design Example	LAB (3) TSR/Rice

Notes: (1) Group A will consist of about 12 technicians, 2 facilitators and 3 observers. Group B will consist of about 12 technicians, 2 facilitators and 3 observers. (Jim Grady is to contact field Divisions to fill the Groups A & B rosters)

- (2) Participants should bring their own calculators and calculation papers, etc.
- (3) Participants should arrange for their own lunch.
- (4) We are planning to arrange for two vans to shuttle participants between the two instruction sites



JAMES B. HUNT IR GOVERNOR

DIVISION OF HIGHWAYS PO. BOX 25201. RALEIGH. N.C. 27611-5201 GARLAND B. GARRETT IR. SECRETARY

Facsimile Memorandum

2 PAGES

CONFIRMATION COPY WILL NOT FOLLOW

DATE:

March 31, 1997

TO:

Doug Hanson (NCAT)

FAX: 8 (334) 844-6248

FROM:

DR. MRINMAY (MOY) BISWAS, P

PHN: (919) 715-2465

FAX: (919) 715-0137

SUB:

NCDOT SPS-9A SUPERPAVE TESTING

PROJECT R-2500A

cc:

PAT STRONG

KEN CREECH

DICK REAVES

BILL PHANG (ITX-STANLEY) BASEL ABUKHATER (ITX/STANLEY)

CECIL JONES

IVAN PECNIK, P.E. (FHWA/LTPP-NARO)

TIM JOHNSON FRED SYKES

MAX TATE (FHWA)

JIM GRADY

JOHN BUKOWSKI (FHWA)

JACK COWSERT

MONTE SYMONS, PE (FHWA-HQ)

Message

Enclosed please find a copy of a Technical Memorandum from Mr Bill Phang of ITX-Stanley delineating various testing to be performed

I will discuss further details with you at the next opportunity you have

Thank you





TECHNICAL MEMORANDUM

TO:

LTPP Contacts - CT, NJ, QE, NC

FROM:

Bill Phang

DATE:

19 September 1996

REFERENCE:

SPS-9A MATERIALS TESTING AT

LCL AND SRTC FILE: 50451231-13.9

Please be advised that the costs of sampling, packaging, shipping and testing of materials for the SPS-9A project are the responsibility of the agency, except as noted below:-

The Materials Research Library (MRL) in Reno, NV will supply special containers for asphalt samples and will pay the shipping charges both ways.

The LTPP Contractor Laboratory (LCL), Law Engineering, Atlanta, GA will carry out the laboratory testing and the FHWA-LTPP Division will pay the testing costs. The state agency will pay for shipping the materials and samples to Law Engineering, Inc. attn.: Mr. Richard Boudreau, 396 Plasters Ave., NE, Atlanta, GA 30324, telephone (404)817-0242, fax (404) 872-5927.

The Superpave Regional Test Center (SRTC) for the LTPP North Atlantic Region is at Penn State University. Please contact Dr. David Anderson, Penn State University, Research Office Building, University Park, PA 16802, telephone (814)863-1912, fax (814)865-3039 to arrange for Superpave testing. Agencies also pay for shipping costs.

North Carolina DOT has arranged for Superpave testing with the SRTC operated by NCAT at Auburn.

Should you have any questions, please all me at (716)632-0804 or speak to Mr. Ivan Pecnik at (716)631-5205.

Sincerely,

ITX Stanley Ltd.

Pavement Management Systems Division

William A. Phang

LTPP Principal Investigator

cc:

I.J. Pecnik, P.E., RE-NARO

E. Lesswing, NARO

B. Abukhater, NARO



JAMES B. HUNT JR. GOVERNOR

DIVISION OF HIGHWAYS PO BOX 25201. RALEIGH. N.C. 27611-5201 GARLAND B. GARRETT JR.
SECRETARY

Memorandum

DATE:

April 3, 1997

TO:

Tim Johnson, P.E.

Fred Sykes Brad Comer (w/o) Jim Grady, P E

Jim Grady, P E Cecil Jones, P.E Jack Cowsert, P.E Pat Strong, P.E.(w/o)

Alman Kuzmar, Ph.D. (w/o) Mustansır Kadıbhaı (w/o)

Jim Travis (FHWA-Raleigh) (w/o)
Basel Abukhater (ITX/Stanley) (w/o)
John Bernadi (Lee Paving) (w/o)

FROM:

Dr Mrinmay (Moy) Biswas, P.E. Hoy_

PHN⁻ (919) 715-2465

SUB:

MEETING ON FRIDAY, APRIL 18, 9:00 AM

DIVISION 8 OFFICE, ABERDEEN, NC

RE:

SPS 9A, Materials Sampling and Testing Strategy

R-2500 A, US 1, Lee and Chatham Counties

CC:

Ken Creech, P.E. Dick Reaves, P.E.

Carson Clippard, P E Bill Medford

Doug Hanson (NCAT) (w/o)

Max Tate, P.E. (FHWA-Raleigh)

Ivan Pecnik, P.E. (FHWA/LTPP-NARO) (w/o)

Bill Phang Ph D (ITX/Stanley) (w/o) John Bukowski (FHWA-H.Q.) (w/o) Monte Symons, P.E. (FHWA-H.Q.) (w/o)

This is to invite you to a strategy planning meeting for SPS-9A Materials Sampling and Testing. The meeting will be held at the Division 8 Headquarters Office, Aberdeen, NC, beginning at 9.00 AM, on Friday, April 18, 1997 (The day after the day of completion of the Superpave School)

As you know, the Superpave test sections of the R-2500A project are the subject of the FHWA-SHRP-LTPP (Long Term Pavement Performance) SPS (Special Pavement Study)-9A

The study requires extensive materials sampling, labeling, storing, transporting, and testing of all components of the pavement including sub-base, asphalt binders, asphalt mixtures, pavement cores, etc.

Different suits of tests will be performed by NCDOT laboratories; the Materials Research Laboratory (MRL), Reno, NV, the LTPP Contractor Laboratory (LCL), Law Engineering, Atlanta, GA, and the Superpave Regional Test Center (SRTC) which, in our case, is the National Center for Asphalt Technology (NCAT), Auburn, AL

ITX-Stanley Ltd (Amherst, NY, Dr. Bill Phang, Principal Investigator) is the FHWA-SHRP-LTPP-NARO (North Atlantic Region Office) contractor. As the representative of ITX-Stanley, Mr. Basel Abukhater will come down to Aberdeen. Mr. Abukhater will attend the full NCDOT Superpave school (April 15 through April 17, 1997) and avail himself of the opportunity of acquainting himself with all NCDOT personnel associated with our Superpave initiatives. Mr. Abukhater has agreed to stay over one extra day and meet with us on Friday, April 18, to discuss, at length, the materials sampling and testing protocols for our SPS-9A-Superpave study.

I shall appreciate if you could attend the meeting

Ps By way of a memo of May 6, 1996, I sent you the current version of the SPS-9A Materials and Sampling Guide With this memo, I am enclosing a few pages that were missing from that copy



APR 2 1 1997



STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

JAMES B. HUNT JR. GOVERNOR

DIVISION OF HIGHWAYS PO BOX 25201. RALEIGH. N.C. 27611-5201 GARLAND B. GARRETT IR. SECRETARY

Memorandum

DATE:

April 9, 1997

TO:

Tim Johnson, P E.

Pat Strong, P E. Aiman Kuzmar, Ph.D. Mustansır Kadıbhaı

Fred Sykes **Brad Comer**

Jim Travis (FHWA-Raleigh)

Jim Grady, P.E. Cecil Jones, P.E. Jack Cowsert, P E.

Basel Abukhater (ITX/Stanley) FAx : (519) 622 - 2580

John Bernadi (Lee Paving)

FROM:

Dr. Mrinmay (Moy) Biswas, P.E. PHN: (919) 715-2465

RE:

SPS 9A, Materials Sampling and Testing Strategy

R-2500 A, US 1, Lee and Chatham Counties

CC:

Ken Creech, P E.

Dick Reaves, PE.

Carson Clippard, P E.

Bill Medford Doug Hanson (NCAT) Max Tate, P.E. (FHWA-Raleigh)

Ivan Pecnik, P.E. (FHWA/LTPP-NARO)

Bill Phang Ph D. (ITX/Stanley) FAx: (716) 632-4808

John Bukowski (FHWA-H Q.) Monte Symons, P.E. (FHWA-H Q)

Based on a letter (copy attached) from Dr. Bill Phang and the SPS 9-A Materials Sampling and Testing Guide, I have come up with the attached tabular list delineating various tasks and respective responsibilities

This table will serve as the basis of our discussion in the meeting on NCDOT SPS-9A materials sampling and testing to be held on April 18, 1997 in Aberdeen, North Carolina.

A representative from ITX/Stanley will provide us with further details regarding various field activities and procedures

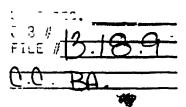
Responsibilities regarding Materials sampling and Testing

Tests to be performed by →	NCDOT Labs & Units	MRL ⁽¹⁾ Reno, NV	LAW Engg. ⁽²⁾ Atlanta, GA	NCAT ⁽³⁾ Auburn, AL
Containers and Boxes provided by:	NCDOT ⁽⁴⁾	MRL	NCDOT ⁽⁴⁾	NCDOT ⁽⁴⁾
Labels provided by:	ITX-Stanley	ITX-Stanley	iTX-Stanley	ITX-Stanley
Collection of Samples and Specimens by:	NCDOT	NCDOT	NCDOT	NCDOT
Protected Storage Space to be provided by:	NCDOT	NCDOT	NCDOT	NCDOT
Packaging & Labeling by:	NCDOT/ ITX-Stanley	NCDOT/ ITX-Stanley	NCDOT/ ITX-Stanley	NCDOT/ ITX-Stanley
Shipping/Transport by:	NCDOT	MRL	NCDOT	NCDOT
Shipping paid by	NCDOT	MRL	NCDOT	NCDOT
Testing or storage \$ paid by	NCDOT	FHWA-LTPP	FHWA-LTPP	NCDOT
Test results to be received by	ITX-Stanley and NCDOT	NA	ITX-Stanley and NCDOT	ITX-Stanley and NCDOT
Bird dogging	NCDOT/R&D and ITX-Stanley			

Notes:

- Materials Research Laboratory (MRL), Attn. Mr. Jim Nichols, 1625 Crane Way, Sparks, NV 89431 Telephone. (702) 358-7574, FAX. (702) 329-5098 (MRL will provide only storage of specimens, no testing will be done)
- 2) Law Engineering, Attn. Mr. Richard Boudreau, 396 Plasters Ave., NE, Atlanta GA 30324 Telephone: (404) 817-0242, FAX (404) 872-5927
- National Center for Asphalt Technology (NCAT), Attn. Mr. Doug Hanson,
 211 Ramsey Hall, Auburn University, Auburn AL 36849
 Phone (334) 844-6240, FAX (334) 844-6248
- 4) Designs and requirements for shipping containers and boxes provided by ITX-Stanley





JAMES B. HUNT IR GOVERNOR

DIVISION OF HIGHWAYS PO. BOX 25201. RALEIGH. N.C. 27611-5201 GARLAND B. GARRETT JR. SECRETARY

T&M

T&M

M&T

T&M

R&D

R&D

FHWA

Memorandum

DATE:

April 21, 1997

TO:

Bill Phang, Ph.D. **ITX-Stanley** Cecil Jones, P.E. **Edward Lesswing ITX-Stanley** Carson Clippard, P.E. M&T Tim Johnson, P E. Div. 8/ Construction Phil Stanberry Graham Johnson Div 8/ Construction Ted Jackson Randall Wester Div. 8/ Construction **Todd Whittington** Div. 8/ Construction Terry Wallace Jim Travis **Bradley Comer** Div. 8/ QA Pat Strong, P E. Jim Grady, P E. Construction Unit Aiman Kuzmar, Ph D. R&D

Jack Cowsert, P E. John Bonardi

PMU

Mustansır Kadıbhaı Lee Paving

FROM:

Mrinmay (Moy) Biswas

Research & Development Unit

PHN (919) 715 2465 FAX (919) 715 0137

EML biswas@swp dot.state nc.us

SUBJECT. SHRP-SPS-9 Study

R 2500A US 1 Lee and Chatham Counties

CC:

Dick Reaves, P.E.

Bill Moore, P.E.

Bill Medford Fred Sykes

Doug Hanson (NCAT) Max Tate, P E. (FHWA)

Thank you very much for your attendance and for your active participation at the subject meeting held on Friday, April 18, 1997 at the Division 8 office in Aberdeen.

The following is a listing of what I understood to be the tasks that are immediately ahead of us.

Details of tasks are listed in the document entitled "Materials Sampling and Testing." In a few days, I will send you copies of the latest version of this document. In the following listings, reference is made to this document.

If you have any questions and/or comments, please contact me (919-715-2465) or Mr. Mustansir (Mustan) Kadibhai (919-715-9677)



SPS-9 Study: R 2500A US 1 Lee and Chatham Counties

New Construction: North Bound Lanes, Full Depth, Three Course, Asphalt Concrete Pavement <u>UPCOMING ACTIVITIES</u>

BEFORE LAYDOWN OF THE BASE COURSES:

WHEN (WEEK OF)	WHAT	Wно
	ESTABLISH STATIONS	
4/21/97 → 4/25/97	Sanford Resident's office arranges for the survey crew to stake the three "test sections" (2800 ft each) and the three "monitoring sections" (500 ft. each), respectively in each study lengths, and also to install temporary bench marks in the middle of each 500 ft. monitoring section. (Figs 2 thru 5)	G. Johnson/ Survey crew
	SUBGRADE MATERIALS SAMPLES AND FIELD TESTING	
	ITX-Stanley sends one or two CD-ROM diskettes containing test protocols to R&D	Lesswing → Biswas
	R&D initiates requisition of insulated containers and	Mustan
	transport boxes, etc. R&D also checks regarding pans and bags, etc.	Mustan
4/28/97 → 5/2/97	R&D sends the test protocol CD-ROM to M&T	Biswas → Jones
and 5/5/97 →	R&D contacts ITX-Stanley (or vice-versa) to check when an ITX-Stanley representative would be available to participate in Subgrade materials sampling	Mustan ↔ Phang
5/9/97	R&D coordinates ITX-Stanley, Resident, Construction Unit and M&T and schedules beginning date for having holes dug and for taking of subgrade material samples.	Mustan/Johnson Phang/ Grady/ Jones
	 Resident contacts the Contractor to arrange for having 3 ft x 3 ft x 1 ft holes (one for each test section) [Refer Figs. 2 thru 5 and Table 2.2] 	Johnson/ Lee Paving
	Holes dug	Lee Paving
	Nuclear density/Moisture and NCDOT std. density tests performed on bottom of the hole (simulated pre-stabilized subgrade)	M&T
	Materials samples taken from the bottom of respective holes and transported to the Blue Ridge Rd. Lab. (These samples are to simulate subgrade sample prior to lime stabilization)	M&T
	Nuclear density/Moisture and NCDOT std. density tests performed on the finished lime stabilized subgrade	M&T
	R&D contacts Geotechnical Unit regarding Shoulder Probes and issues job order	Biswas/ Bill Moore Pat Strong
	R&D sends Sampling Data Sheets 8-1 and 9 to ITX-Stanley	Mustan
	(→ Continued)	

WHEN (WEEK OF)	WHAT	Wно
(continued)	SUBGRADE MATERIALS SAMPLES AND FIELD TESTING (CONTINUED)	
4/28/97 → 5/2/97 and 5/5/97 →	Contractor provides preliminary schedule of various sequences of construction	Lee Paving/ Resident/ R&D/ ITX-Stanley/ Other
5/9/97	R&D contacts Resident regarding having Survey party to install center-line offsets	Mustan/ Johnson
	Contractor provides the actual schedule of lay-down of the base course at least one week ahead (to allow iTX-Stanley personnel and others to be present)	Lee Paving/ Resident/ R&D/ ITX-Stanley/ Other
	R&D contacts Geotechnical Unit to schedule Shoulder Probe	Mustan/ Bill Moore
	R&D informs ITX-Stanley and all others	Mustan/
5/12/97	Shoulders Probes completed	Geotech
	Center-line offsets installed	Survey party
	Subgrade samples tested	M&T
5/17/97	R&D coordinates transmittal of test data to ITX Stanley	Mustan

<u>DURING LAYDOWN OF THE BASE COURSES (AND IMMEDIATELY THEREAFTER):</u>

WHEN (WEEK OF)	WHAT	Wно
	5 point levels @ 50 ft taken on finished stabilized subgrade	Resident/Survey
	Taking of Asphalt binder samples (Fig. 2 thru 5, Table 2.2 Typ) Taking of Asphalt agreements as a second of the samples (#)	
	 Taking of Asphalt aggregates samples (") Taking of HMAC samples for MRL (") 	
	Taking of HMAC gyratory compaction samples (")	
	Nuclear density and NCDOT std. density tests on the finished base course[s]	
	5 point levels @ 50 ft taken on the finished base course[s]	Resident/Survey
	Contractor provides specific schedule of laydown of the Binder course of each test section at least one week ahead	Lee Paving/ Resident/ R&D/ ITX-Stanley/ Other

<u>DURING LAYDOWN OF THE BINDER COURSES (AND IMMEDIATELY THEREAFTER):</u>

WHEN (WEEK OF)	WHAT	Wно	
	Details TBD	R&D	
	•		
	Contractor to provide specific schedule of laydown of the Surface course of each test section at least one week ahead	Lee Paving/ Resident/ R&D/ ITX-Stanley/ Other	

DURING LAYDOWN OF THE SURFACE COURSES (AND IMMEDIATELY THEREAFTER):

WHEN (WEEK OF)	WHAT	Wно
	Details TBD	R&D

AFTER COMPLETION OF LAYDOWN OF THE **SURFACE** COURSES

WHEN (WEEK OF)	WHAT	Wно
	Details TBD	R&D

ADDITIONAL DISCUSSIONS INCLUDED THE FOLLOWING:

- Desk space[s] for representatives from ITX-Stanley, Ltd., and from NCDOT-Research & Development Unit will be provided at the office of the Sanford Resident Engineer.
- Storage space for all material samples and specimens will be provided at the Div. 8 QA Lab (Bradley Comer)
- HMAC gyratory compaction of specimens (for Superpave performance testing at NCAT) will be done at the Div. 8 QA Lab. (Bradley Comer). Alternative location (closer to the construction site) for gyratory compaction may be considered as an option.
- Project CBR data that are available should be forwarded to ITX-Stanley.
- Project Geotechnical data that are available should be sent to ITX-Stanley
- Project asphalt binder (related to the test sections) quality certification data, that would become available, should be sent to ITX-Stanley.
- Test section numbers as they are shown on Figure 2 are not consistent with those given in the project special provisions. This discrepancy should be corrected.
- ITX-Stanley will provide NCDOT-R&D with a suggested desirable list of tests that could be performed related to the base and binder layers which are out of the scope of the SPS 9A study R&D will evaluate this list vis-a-vis that provided by NCAT and decide on what tests should be performed.



FAX MEMORANDUM

TO:

Dr. "Mov" Biswas - NC DOT - 919/715-0137

FROM:

Bill Phang

DATE:

13 May 1997

REFERENCE:

SPS-9A Project 370900 Hwv. US-1 Northbound,

Sanford, NC - New Construction

FILE: 50451219-13.18.9

NO. OF PAGES:

1

As requested in the minutes of our meeting of April 18, 1997, in Aberdeen, here are our recommendations for tests of the asphalt concrete mixes used in the base course (Type HB), and the binder course (Type HDB).

1) For the Superpave Test Section:

Repeat tests on Table 7. Table 8. and on the Abson Recovered Asphalt Binder, the AE02/P22, AE05/P25, AE03/P23, the DSR test (AASHTO TP5), Creep Stiffness (AASHTO TP1), and Direct Tension Test (AASHTO TP3)

2) For Other Test Sections - For Binder Course:

Repeat tests on Table 6 and tests on the recovered asphalt binder as in 1 above.

Tests on the base course material may also be run but utility of the results are unknown at this time.

William A. Phang

LTPP Principal Investigator

cc.

E. Lesswing, NARO

B. Abukhater, NARO



JAMES B. HUNT IR GOVERNOR

DIVISION OF HIGHWAYS PO BOX 25201 RALEIGH NC 27611-5201 GARLAND B GARRETT JR. SECRETARY

Memorandum

DATE

May 21, 1997

TO

Tim Johnson, P.E. Fred Sykes (Protocols) John Olinger (Protocols) Brad Comer (Protocois)

Jim Grady, P E.

Cecil Jones, P.E. (Protocols)

Carson Clippard, P E. (Protocols)

Mehdi Haeri (Protocols)

Todd Whittington (Protocols) Bill Medford (Protocols)

Jack Cowsert, P.E.

FROM Dr Mrinmay (Moy) Biswas, P.E.

RE

SPS 9A, Materials Collection, Distribution, and Testing Work Plan.

6.549001T / R-2500 A. US 1. Lee and Chatham Counties

CC

Ken Creech, P E Dick Reaves, P.E.

Bill Phang Ph D (ITX/Stanley)

Aiman Kuzmar, Ph.D.

Mustansir Kadibhai

Jim Trogdon, P.E.

Pat Strong, P.E.

Doug Hanson (NCAT)

John Bonardi (Lee Paving)

Jim Travis (FHWA-Raleigh) (Protocols)

Sam Johnson (Martin Marietta) (Protocols) Horace Turbeville (Citgo) (Protocols)

Ed Lesswing, P.E. (ITX/Stanley)

Basel Abukhater (ITX/Stanley)

Max Tate, P E. (FHWA-Raleigh) John Bukowski (FHWA-H Q)

Monte Symons, P.E. (FHWA-H Q)

On the basis of a hand revised Materials Sampling and Testing Plan that we recently received from ITX-Stanley, Ltd., Mr. Abukhater of ITX-Stanley, Mr. Kadibhai of R&D Unit, and I have prepared a "simplified" Material Collection, Distribution and Testing Work Plan, regarding the construction phase of the three test sections of the project

The SHRP-LTPP SPS-9A effort addresses only the surface course of test sections and emphasizes the test section (termed the "Superpave Section") that utilizes the PG-64-22 AC binder Also, a recent LTPP directive postpones all Superpave Shear Testing [SST] of (1) Lab-mixed, lab-gyratory compacted [LGC] specimens, (2) Plant-mixed, LGC specimens, and excludes (3) taking of field cores (for SST)

I prepared the attached "Material Collection, Distribution and Testing Work Plan" on the premise that NCDOT will pursue a comprehensive study, and on the basis of following assumptions

All three courses (i.e., base, binder and surface) will be studied, and specimens will be subject to SST (at NCAT) and other Superpave performance tests, i.e., Resilience Modulus, Indirect Tensile and Creep Compliance (at Law Engineering)

Both the Superpave section (using PG 64-22 AC binder) and Alternative Superpave Section (using PG 70-22 AC binder) will be studied

Upon evaluation of costs, NCDOT will decide upon what and by whom actual testing will be performed

An outline of the plan is given on the next page. (Note that all samples will be taken at the plant)

The plan delineates work to be performed by respective Units and Sub-units of NCDOT as well as material and data that will be needed from the contractor and/or materials suppliers



SPS-9A/ 6.549001T/R2500 A/ US 1 NB / LEE COUNTY MATERIAL COLLECTION, DISTRIBUTION AND TESTING WORK PLAN

I. Section 3 (PG 64-22 AC Binder) Superpave (SHRP Section ID 370902)

Base Course

AC Binder

Aggt. Components

Plant Mix

Binder Course

AC Binder

Aggt. Components

Plant Mix

Surface Course

AC Binder

Aggt. Components

Plant Mix

What will QA Lab do?

What will Bituminous Lab do?

What will Soil Lab do?

11. Section 2 (AC-20 Binder) NC Standard Mix (SHRP Section ID 370901)

Base Course

AC Binder

Aggt. Components

Plant Mix

Binder Course

AC Binder

Aggt. Components

Plant Mix

Surface Course

AC Binder

Aggt Components

Plant Mix

What will QA Lab do?

What will Bituminous Lab do?

III. Section 1 (PG 70-22 AC Binder) Alternative Superpave (SHRP Section ID 370903)

Base Course

AC Binder

Aggt Components

Plant Mix

Binder Course

AC Binder

Aggt Components

Plant Mix

Surface Course

AC Binder

Aggt Components

Plant Mix

What will QA Lab do?

What will Bituminous Lab do?

IV For each of Section 3, Section 2 and Section 1

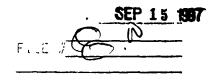
What will Asphalt Lab do?

Specimens and Data Needed From Contractor:

Data Needed From Martin Marietta

Data Needed From Citgo





JAMES B. HUNT JR. GOVERNOR DIVISION OF HIGHWAYS PO BOX 25201. RALEIGH. N.C. 27:011-5201 GARLAND B. GARRETT JR.
SECRETARY

Memorandum

DATE:

September 10, 1997

TO:

W. M. (Bill) Medford

Chemical Testing Engineer

FROM:

Moy Biswas

Research & Development Unit

PHN (919) 715-2465

FAX. (919) 715-0137

EML. biswas@swp.dot.state nc us

RE.

SPS 9A

6 549001T, R-2500 A, US 1NB Lee and Chatham Counties

SUB:

TESTING OF ASPHALT BINDERS

CC:

Ted Jackson, Distribution (over)

Attached please find pages regarding testing of asphalt binders for the subject project. The pages contain the following

Test of virgin asphalt binders. Numbering plan of test samples

Test of virgin asphalt binders. Typical tests to be performed

Test of recovered aspnalt binders. Typical tests to be performed

Copies or all relevant LTPP Test Protocols are attached here

The two LTPP documents referred to in the above pages are

Material Sampling and Testing Plan

Samoure and Testing Guidelines

Relevant pages from these two documents are attached here

Cores have been/will be taken at Times A = 0 months B = 6 months C = 12 months D = 18 months. E = 24 months and E = 48 months. Aspnait binders recovered from cores will be given to you for testing at respective times

Distribution

Tim Johnson, P E. Fred Sykes Dick Reaves, P E. Cecil Jones, P.E. Carson Clippard, P E. Phil Stanberry Bill Medford Jim Grady, P E. Jack Cowsert, P E. Brad Comer Max Tate. P E. (FHWA-Raleigh) Jim Travis (FHWA-Raleigh) Bill Phang Ph.D /Ed Lesswing, P E (ITX/Stanley) Basei Abukhater (ITX/Stanley) Larry Oldham (Lee Paving) John Bonardi (Lee Paving) Pat Strong, P E. Mustansır Kadıbhai

SPS-9A TEST OF <u>Virgin</u> Asphalt Binders

Numbering Plan of Test Samples

(Respective asphalt binder samples are in one quart cans with sample numbers on them)
(9 quarts for 9 layers)

TEST SECTION NO.	LAYER	BINDER GRADE	SAMPLE NO. §	DATE SAMPLED	SAMPLE LOCATION
SECTION 1 (SHRP 370903)	BASE (SP 37.5)	PG 70-22	BC03A03	7/10/97	PLANT
	BINDER (SP 19)	PG 70-22	BC02.A03	7/11/97	PLANT
	SURFACE (SP 12 5)	PG 70-22	BC01A03	7/12/97	PLANT
SECTION 2 (SHRP 370901)	BASE (HB)	AC-20	BC03 401	5/28/97	PLANT
	BINDER (HDB)	AC-20	BC02 401	5/28/97	PLANT
	SURFACE (HDS)	AC-20	BC01A01	5/28/97	PLANT
SECTION 3 (SHRP 370902)	BASE (SP 37 5)	PG 64-22	BC03 A02	5/28/97	PLANT
	BINDER (SP 19)	PG 64-22	BC02A02	5 28,97	PLANT
	SURFACE (SP 12.5)	PG 64-22	BC01 A02	5/28/97	PLANT

Refer to attached Tables Numbered 4-11, 12, and 15, from the LTPP Materials Sampting and Testing Plan

SPS-9A TEST OF <u>Virgin</u> Asphalt Binders

Typical Tests to be Performed

LABORATORY TEST	NO. OF TESTS	PROTOCOL NO. §	LTPP TEST NO. §	LAB. TEST NO.§
Penetration @ 5° C	1 test w/ 3 readings	AASHTO T49		3
Penetration @ 25° C & 46° C	2 test w/ 3 readings	P22	AE02	3
Viscosity @ 60° C & 135° C	2 tests each	P25	AE05	3
Specific Gravity @ 16° C	2 tests each	P23	AE03	3
Dynamic Shear @ 3 Temperatures	2 tests each	AASHTO TP5		3
Brookfield Viscosity @ 135° C & 165° C	1 test each	ASTM D4402		3
Rolling Thin Film (RTFOT)*		AASHTO T240		3
Dynamic Shear on RTFOT Residue @ 3 Temps *	2 tests each	A ASHTO TP5		3
Pressure Aging (PAV) of RTFOT Residue*		AASHTO PPI		3
Creep Stiffness of PAV Residue (2 Temps)* (24 hr. conditioning)	2 tests each	AASHTO TPI		3
Creep Stiffness of PAV Residue (2 Temps)*	2 tests each	A ASHTO TPI		3
Dynamic Shear of PAV Residue (3 Temps)*	2 tests each	A ASHTO TP5		3
Direct Tension of PAV Residue (2 Temps)*	2 tests each	A ASHTO TP3		3

Refer to attached Tables Numbered 4-11-12, and 15-from the LTPP Materials Sampling and Testing Plan

^{*} Refer to attached pages 49 to 53, from SPS-9A Sampling and Testing Guidetines, Feb. 1996

SPS-9A

TEST OF RECOVERED ASPHALT BINDERS

Typical Tests to be Performed

There will be three grades of asphalt binders, i.e., PG 70-22, AC-20, and PG 64-22. These binders will be recovered from cores taken from Sections 1, 2, and 3 respectively. Mr. Carson Clippard will give you the recovered Asphalt Binder samples.

LABORATORY TEST	PROTOCOL NO.§	LTPP TEST NO. §
Penetration @ 5° C (3 readings)	AASHTO T49	
Penetration © 25° C and 46° C (3 readings each)	P22	AE02
Viscosity @ 60° C and 135° C (2 readings each)	P25	AE05
Specific gravin @ 16° C (2 readings each)	P23	AE03
Dynamic shear @ 3 Temperatures*	AASHTO TP5	
Creep stiffness @ 2 Temperatures*	A.ASHTO TPI	
Direct Tension $\bar{q}/2$ Temperatures*	AASHTO TP3	

Refer to attached Tables Numbered 4-11-12, and 15, from the LTPP Vaterials Sampling and Testing Plan

^{*} The test temperatures should be the same as those used for the tests on the RTFOT-PAV conditioned samples. (Refer to attached pages from SPS-9A Sampling and Testing Guidelines, Feb. 1996.)

w5.08.1998 11:57 FRUM



STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

JAMES B. HUNT IR COVERNOR

P.O. BOX 25201, RALEIGH, N.C. 27611-5201

E. Norkis Tolson SECRETARY

FACSIMILE MEMORANDUM

1 PAGE

CONFIRMATION COPY WILL NOT FOLLOW

FAX: (716) 632-4808

EML: biswas@swp.dot.state.nc.us

PHN: (716) 632-0804

PHN: (919) 715-2465

FAX: (919) 715-0137

DATE: MAY 8, 1998

To:

DR. WILLIAM A. PHANG

ITX-STANLEY

FROM:

DR MRINMAY (MOY) BISWAS, P.E.

RESEARCH & DEVELOPMENT UNIT

One South Wilmington St. RM 506

PROJECT:

NCDOT SPS-9A

SUBJECT:

SITE ELEVATIONS FOR VIRTUAL WEATHER STATION.

REFERENCE: YOUR EARLIER TELEPHONE MESSAGE

cc:

Mr. Basil Abukhater

ITX-Stanley/ Cambridge, Ontarlo

FAX (519) 622-2580

PHN: (519) 622-3005

Message.

Based on my communications with Messrs. Jack Cowsert and Fred Sykes, the following is a summary information on the subject:

The elevations in the test sections vary from 300 to 270.

The most of it is within 10 feet of 290.

A value of either 290 feet or 300 feet may be used.



APPENDIX C

Sampling and Testing Plans Developed by NC DOT, Dr. Biswas

Section 3 (PG 64-22 AC Binder) SUPERPAVE (SHRP Section ID 370902)

	How MUCH?	То Wном?	What for?
BASE Course			
AC Binder (from Plant)	2 pails	1 for Clippard 1 for NCAT	To prepare 20 GC +1 loose To prepare 20 GC
	1 quart	Medford	for binder testing
Aggt components	10 bags @ 50 lb.	5 to Clippard	To prepare 20 GC +1 loose
(from Plant)	(to be blended @ labs)	5 to NCAT	To prepare 20 GC
	2 bags blended @50 lb.	Haeri	for fines analysis
Plant mix	3 pans	QA Lab	for QA Work 6 for MRL
(corresponding	11 boxes	QA Lab	5 for NCAT
Sta. 94+00)	14 ½ bags @ 30 lb.	QA Lab	20 GC samples for NCAT 8 GC samples for LAW/NCDOT
	(77.4) 2 hans @ 20 lb	OATab	½ bag for 3 loose for Clippard for 6 GC samples
	(Hot) 3 bags @ 30 lb.	QA Lab	1 101 0 OC Samples
BINDER Course			
AC Binder	2 pails	1 for Clippard	To prepare 20 GC +1 loose
(from plant)		1 for NCAT	To prepare 20 GC
V P ,	1 quart	Medford	for binder testing
Aggt components	10 bags @ 50 lb.	5 to Clippard	To prepare 20 GC +1 loose
(from Plant)	(to be blended @ labs)	5 to NCAT	To prepare 20 GC
	2 bags blended @50 lb.	Haeri	for fines analysis
Plant mix	3 pans	QA Lab	for QA Work
(Corresponding	11 boxes	QA Lab	6 for MRL
Sta. 94+00)	1		5 for NCAT
	14 ½ bags @ 30 lb	QA Lab	20 GC samples for NCAT 8 GC samples for LAW/NCDOT
	1		1/2 bag for 3 loose for Clippard
	(Hot) 3 bags @ 30 lb.	QA Lab	for 6 GC samples
	(Hot) 3 bags (a 30 lb.	QA Lab	Tot o de samples
SURFACE Course		I to MPI	
AC Binder	4 pails	1 to MRL 1 to NCAT	To prepare 20 GC
(from plant)		2 to Clippard	To prepare 40 GC +1 loose
	1	Medford	for binder testing
	l quart	MRL	
Aggt.	10 pails (blended) 2 bags blended @50 lb.	Haen	for fines analysis
(from plant)		_	
	Components to blend in	10 for Clippard	To prepare 40 GC +1 loose
	lab 15 bags @ 50 lb	5 for NCAT	To prepare 20 GC
Plant mix	3 pans	QA Lab	QA work for NCAT
(Corresponding	5 boxes	QA Lab	20 GC for MRL
Sta. 94+00)	241/2 bags @ 30 lb	QA Lab	8 GC for LAW
			20 GC for NCAT
	i	1	1 20 00 101 110 11
			1/2 bag for 3 loose for Clippard

What will QA LAB Do? (Brad Comer, Supervisor)

BASE Course:

Plant mix (3 pans): Usual NCDOT QA (keep specimens)

From (Hot) Plant Mix (3 Bags @ 30 lb. in one cooler), compact 6 GC specimens,

@ 4800 gm ea. @ N_{max} to 115 mm. (AASHTO TP4) Do Bulk sp. gr. (Protocol P02)

& volumetrics (AASHTO PP19)(keep specimens)

From 14 bags of plant mix, compact a total of 28 specimens, @5700 gm.

to 140 mm, as follows:

2 specimens @ 3% air voids (to be shipped to NCAT)

26 specimens @ 7% air voids

3 specimens, do bulk sp. gr. (2 to be shipped to NCAT

I to be shipped to LAW/NCDOT) 7 specimens to be shipped to LAW/NCDOT

16 specimens to be shipped to NCAT

BINDER Course

Plant mix (3 pans): Usual NCDOT QA (keep specimens)

From (Hot) Plant Mix (3 Bags @ 30 lb. in one cooler) compact 6 GC specimens,

@ 4800 gm ea. @ N_{max} to 115 mm. (AASHTO TP4) Do Bulk sp. gr. (Protocol P02)

& volumetrics (AASHTO PP19)(keep specimens)

From 14 bags of plant mix, compact a total of 28 specimens, @5700 gm.

to 140 mm, as follows:

7 specimens

2 specimens @ 3% air voids (to be shipped to NCAT)

26 specimens @ 7% air voids

3 specimens, do bulk sp. gr. (2 to be shipped to NCAT

> I to be shipped to LAW/NCDOT) to be shipped to LAW/NCDOT

16 specimens to be shipped to NCAT

SURFACE course:

Plant mix (3 pans) Usual NCDOT QA (keep specimens)

(Hot) Plant Mix (3 bags in one cooler) compact 6 GC specimens,

(AASHTO TP4) @ 4800 gm ea. @ N_{max} to 115 mm. (Protocol P02) Do Bulk sp. gr.

(AASHTO PP19)(keep specimens) & volumetrics

From 24 bags of plant mix, compact a total of 48 specimens, @5700 gm

to 140 mm, as follows

4 specimens @ 3% air voids (@2 ea to be shipped to MRL & \C4T)

44 specimens @ 7% air voids

(ship to MRL [2], NCAT[2] & LAW[1]) 5 specimens, do bulk sp. gr.

7 specimens to be shipped to LAW ship to MRL[16], \CAT[16] 32 specimens

SPS-9A/ R2500 A/ US 1 NB / Lee County Section 3 (PG 64-22) Superpave

What will BITUMINOUS LAB do? (Carson Clippard)

BASE Course

Troin /2 dag plant high, bispare o toose samples (w, 2000 gill ea. (need not need)	From 1/2 bag plant n	nix: prepare 3 loose samp	oles @ 2000 gm ea.	(need not keep)
--	----------------------	---------------------------	--------------------	-----------------

And do (a) Max sp. gr. (Protocol P03)
(b) Extraction (Protocol P04)
(c) Aggt. gradation (Protocol P14)

From 5 bags of Aggt. mix @ 50 lb., and one pail of 64-22 binder, produce "Job Mix" asphalt mixture in the lab, separate 1 loose sample of 2000 gm. and prepare 20 GC specimens as follows:

(AASHTO TP 4)

6 specimens, 4800 gm @ N_{max} to 115 mm, do bulk sp. gr. (Protocol P02) and volumetrics (keep samples) (AASHTO PP19)

14 specimens, 5700 gm @ 7% air voids, to 140 mm

6 specimens: do bulk sp gr and moisture susceptibility (keep samples) (Protocol P05)

1 specimen: do bulk sp gr (to be shipped to LAW/NCDOT)

7 specimens to be shipped to LAW/NCDOT

Using the loose sample, do max. sp. gr. test. (need not keep) (Protocol P03)

BINDER course

From '2 bag plant mix: prepare 3 loose samples @ 2000 gm ea. (need not keep)

And do (a) Max sp. gr. (Protocol P03)
(b) Extraction (Protocol P04)
(c) Aggt. gradation (Protocol P14)

From 5 bags of Aggi. mix @ 50 lb, and one pail of 64-22 binder.

produce "Job Mix" asphalt mixture in the lab, separate 1 loose sample of 2000 gm.,

and prepare 20 GC specimens as follows: (AASHTO TP 4)

6 specimens, 4800 gm @ N_{max} to 115 mm, do bulk sp. gr. (Protocol P02) and volumetrics (keep samples) (AASHTO PP19)

14 specimens, 5700 gm @ 7% air voids, to 140 mm

6 specimens do bulk sp gr and moisture susceptibility (keep samples) (Protocol P05)

I specimen do bulk sp gr (to be shipped to LAW/VCDOT)

7 specimens to be shipped to LAW/NCDOT

Using the loose sample, do max sp. gr test (need not keep) (Protocol P03)

SPS-9A/ R2500 A/ US 1 NB / Lee County Section 3 (PG 64-22) Superpave

What will BITUMINOUS LAB do? (Carson Clippard) (continued)

SURFACE course:

From ½ bag plant mix: prepare 3 loose samples @ 2000 gm ea. (need not keep)

And do (a) Max sp. gr. (Protocol P03)
(b) Extraction (Protocol P04)
(c) Aggt. gradation (Protocol P14)

From 10 bags of Aggt. mix @ 50 lb., and two pails of 64-22 binder, produce "Job Mix" asphalt mixture in the lab, separate 1 loose sample of 2000 gm. and prepare 40 GC specimens as follows: (AASHTO TP 4)

6 specimens, 4800 gm @ N_{max} to 115 mm, do bulk sp. gr. (Protocol P02)

and volumetrics (keep samples) (AASHTO PP19)

1 specimen, 5700 gm @ 3% air voids, to 140 mm, do bulk sp. gr. (to be shipped to MRL)

1 specimen, 5700 gm @ 3% air voids, to 140 mm, (to be shipped to MRL)

32 specimens, 5700 gm @ 7% air voids, to 140 mm

6 specimens: do bulk sp gr and moisture susceptibility (keep samples) (Protocol P05)

2 specimens: do bulk sp gr (1 to be shipped to MRL

I to be shipped to LAW)

7 specimens to be shipped to LAW

17 specimens to be shipped to MRL

Using the loose sample, do max. sp. gr. test. (need not keep) (Protocol P03)

SPS-9A/ R2500 A/ US 1 NB / Lee County Section 3 (PG 64-22) Superpave

What will SOIL LAB do? (Mehdi Haeri)

BASE Course

From 2 bags of Combined Aggt. mix @ 50 lb., do the following aggt. Tests:

Sp. gr. of fines passed 200

(AASHTO T100)

BINDER Course

From 2 bags of Combined Aggt. mix @ 50 lb., do the following aggt. Tests:

Sp. gr. of fines passed 200

(AASHTO T100)

SURFACE Course

From 2 bags of Combined Aggt. mix @ 50 lb., do the following aggt. Tests:

Sp. gr. of fines passed 200

(AASHTO T100)

Section 2 (AC-20 Binder) NC Standard Mix (SHRP Section ID 370901)

	How much?	То Wном?	WHAT FOR?
BASE Course	<u> </u>		
AC Binder	½ pail	Clippard	to prepare 9 GC + 1 loose
(from Plant)	1 quart	Medford	for binder testing
Aggt. Mix (from Plant)	3 bags blended @ 50 lb.	Clippard	to prepare 9 GC + 1 loose
Plant mix	3 pans (from plant)	QA Lab	for QA Work
(Corresponding	1/2 bag @ 30 lb.	QA Lab	to prepare 3 loose for Clippard
Sta. 55+50)	(Hot) 3 bags @ 30 lb.	QA Lab	to prepare 6 GC samples
BINDER Course			
AC Binder	½ pail	Clippard	to prepare 9 GC + 1 loose
(from Plant)	1 quart	Medford	for binder testing
Aggt. Mix	3 bags blended @ 50 lb.	Clippard	to prepare 9 GC + 1 loose
(from Plant)		<u> </u>	
Plant mix	3 pans (from plant)	QA Lab	for QA Work
(Corresponding	1/2 bag @ 30 lb.	QA Lab	to prepare 3 loose for Clippard
Sta. 55+50)	(Hot) 3 bags @ 30 lb.	QA Lab	to prepare 6 GC samples
SURFACE Course			
AC Binder	1½ pails	1 to MRL	
(from plant)	}	1/2 to Clippard	to prepare 9 GC + 1 loose
-	l quart	Medford	for binder testing
Aggt. mix	10 pails blended	MRL	
(from plant)	3 bags blended @ 50 lb.	Clippard	to prepare 9 GC + 1 loose
Plant mix	3 pans (from Plant)	QA Lab	QA work
(Corresponding	1/2 bag @ 30 lb.	QA Lab	to prepare 3 loose for Clippard
Sta. 55+50)	(Hot) 3 bags @ 30 lb	QA lab	to prepare 6 GC samples

SPS-9A/ R2500 A/ US 1 NB / Lee County Section 2 AC-20 Binder NC Standard Mix

What will OA LAB DO? (Brad Comer, Supervisor)

BASE Course:

Plant mix (3 pans): Usual NCDOT QA (keep specimens)

From (Hot) Plant Mix (3 Bags @ 30 lb. in one cooler), compact 6 GC specimens,

@ 4800 gm ea. @ N_{max} to 115 mm.

(AASHTO TP4)

Do Bulk sp. gr.

(Protocol P02)

& volumetrics

(AASHTO PP19)(keep specimens)

BINDER Course

Plant mix (3 pans): Usual NCDOT QA (keep specimens)

From (Hot) Plant Mix (3 Bags @ 30 lb. in one cooler), compact 6 GC specimens,

@ 4800 gm ea. @ N_{max} to 115 mm.

(AASHTO TP4)

Do Bulk sp. gr.

(Protocol P02)

& volumetrics

(AASHTO PP19)(keep specimens)

SURFACE course:

Plant mix (3 pans): Usual NCDOT QA (keep specimens)

From (Hot) Plant Mix (3 bags @ 30 lb. in one cooler), compact 6 GC specimens.

@ 4800 gm ea. @ N_{max} to 115 mm.

(AASHTO TP4)

Do Bulk sp. gr.

(Protocol P02)

& volumetrics

(AASHTO PP19)(keep specimens)

SPS-9A/ R2500 A/ US 1 NB / Lee County Section 2 (AC-20 Binder) NC Standard Mix

What will BITUMINOUS Lab do? (Carson Clippard)

BASE Course

From ½ bag plant mix: prepare 3 loose samples @ 2000 gm ea. (need not keep)

And do	(a) Max sp. gr.	(Protocol P03)
	(b) Extraction	(Protocol P()4)
	(c) Aggt. gradation	(Protocol P14)

From 3 bags of Aggt. mix @ 50 lb, and ½ pail of AC-20 binder,

produce "Job Mix" asphalt mixture in the lab, separate 1 loose sample of 2000 gm.

and prepare 9 GC specimens as follows: (AASHTO TP 4)

3 specimens, 4800 gm @ N_{max} to 115 mm, do bulk sp. gr. (Protocol P02) and volumetrics (keep samples) (AASHTO PP19)

6 specimens, 5700 gm @ 7% air voids, to 140 mm

Do bulk sp gr and moisture susceptibility (keep samples) (Protocol P05)

Using the loose sample, do max. sp. gr. test. (need not keep) (Protocol P03)

BINDER course

From $\frac{1}{2}$ bag plant mix: prepare 3 loose samples @ 2000 gm ea. (need not keep)

And do	(a) Max sp. gr.	(Protocol P03)
	(b) Extraction	(Protocol P04)
	(c) Aggt. gradation	(Protocol P14)

From 3 bags of Aggt. mix @ 50 lb, and 1/2 pail of AC-20 binder,

produce "Job Mix" asphalt mixture in the lab, separate 1 loose sample of 2000 gm and prepare 9 GC specimens as follows:

(AASHTO TP 4)

3 specimens, 4800 gm @ N_{max} to 115 mm, do bulk sp. gr. (Protocol P02) and volumetrics (keep samples) (AASHTO PP19)

6 specimens, 5700 gm @ 7% air voids, to 140 mm

Do bulk sp gr and moisture susceptibility (keep samples) (Protocol P05)

Using the loose sample, do max sp. gr test (need not keep) (Protocol P(13)

SPS-9A/ R2500 A/ US 1 NB / Lee County Section 2 (AC-20 Binder) NC Standard Mix

What will BITUMINOUS LAB do? (Carson Clippard) (continued)

SURFACE course:

From ½ bag plant mix: prepare 3 loose samples @ 2000 gm ea. (need not keep)

And do (a) Max sp. gr. (Protocol P03)
(b) Extraction (Protocol P04)
(c) Aggt. gradation (Protocol P14)

From 3 bags of Aggt. mix @ 50 lb, and ½ pail of AC-20 binder, produce "Job Mix" asphalt mixture in the lab, separate 1 loose sample of 2000 gm.

and prepare 9 GC specimens as follows: (AASHTO TP 4)

3 specimens, 4800 gm @ N_{max} to 115 mm, do bulk sp. gr. (Protocol P02) and volumetrics (keep samples) (AASHTO PP19)

6 specimens, 5700 gm @ 7% air voids, to 140 mm

do bulk sp gr and moisture susceptibility (keep samples) (Protocol P05)

Using the loose sample, do max. sp. gr. test. (need not keep) (Protocol P03)

Section 1 (PG 70-22 AC Binder) Alternative SUPERPAVE (SHRP Section ID 370903)

	How Much?	То Wном?	WHAT FOR?
BASE Course			
AC Binder (from Plant)	2 pails	1 to Clippard 1 to NCAT to Medford	To prepare 20 GC +1 loose To prepare 20 GC for binder testing
Aggt components (from Plant)	10 bags @ 50 lb. (to be blended @ labs)	5 to Clippard 5 to NCAT	To prepare 20 GC +1 loose To prepare 20 GC
Plant mix (Corresponding Sta. 33+50)	3 pans 5 boxes 14 ½ bags @ 30 lb. (Hot) 3 bags @ 30 lb.	QA Lab QA Lab QA Lab QA Lab	for QA Work for NCAT 20 GC samples for NCAT 8 GC samples for LAW/NCDOT 1/2 bag for 3 loose for Clippard to prepare 6 GC samples
BINDER Course	(Hot) 3 bags (a 30 to.	QALab	to prepare o GC samples
AC Binder (from plant)	2 pails	1 to Clippard 1 to NCAT	To prepare 20 GC +1 loose To prepare 20 GC
Aggt components (from Plant)	1 quart 10 bags @ 50 lb. (to be blended @ labs)	to Medford 5 to Clippard 5 to NCAT	for binder testing To prepare 20 GC +1 loose To prepare 20 GC
Plant mix (Corresponding Sta. 33+50)	3 pans 5 boxes 14 ½ bags @ 30 lb.	QA Lab QA Lab QA Lab	for QA Work for NCAT 20 GC samples for NCAT 8 GC samples for LAW/NCDOT 1/2 bag for 3 loose for Clippard
SURFACE Course	(Hot) 3 bags @ 30 lb	QA Lab	to prepare 6 GC samples
AC Binder (from plant)	3 pails	1 to MRL 1 to NCAT 1 to Clippard to Medford	to prepare 20 GC to prepare 20 GC +1 loose for binder testing
Aggt. (from plant)	Components to make blended 10 bags @ 50 lb.	5 to Clippard 5 to NCAT	to prepare 20 GC +1 loose to prepare 20 GC
Plant mix (Corresponding Sta. 33+50)	3 pans 5 boxes 14½ bags @ 30 lb	QA Lab QA Lab QA Lab	QA work for NCAT 8 GC for LAW/NCDOT 20 GC for NCAT ½ bag for 3 loose for Clippard
	(Hot) 3 bags @ 30 lb	QA lab	to prepare 6 GC samples

SPS-9A/ R2500 A/ US 1 NB / Lee County Section 1 (PG 70-22 AC Binder) Alternative SUPERPAVE

What will QA LAB Do? (Brad Comer, Supervisor)

BASE Course:

Plant mix (3 pans): Usual NCDOT QA (keep specimens)

From (Hot) Plant Mix (3 Bags @ 30 lb. in one cooler), compact 6 GC specimens,

@ 4800 gm ea. @ N_{max} to 115 mm.

(AASHTO TP4)

Do Bulk sp. gr.

(Protocol P02)

& volumetrics

(AASHTO PP19)(keep specimens)

From 14 bags of plant mix, compact a total of 28 specimens, @5700 gm.

to 140 mm, as follows:

2 specimens @ 3% air voids

(to be shipped to NCAT)

26 specimens @ 7% air voids

3 specimens, do bulk sp. gr.

(2 to be shipped to NCAT

I to be shipped to LAW/NCDOT) to be shipped to LAW/NCDOT

7 specimens 16 specimens

to be shipped to NCAT

BINDER Course

Plant mix (3 pans): Usual NCDOT QA (keep specimens)

From (Hot) Plant Mix (3 Bags @ 30 lb. in one cooler) compact 6 GC specimens,

@ 4800 gm ea. @ N_{max} to 115 mm.

(AASHTO TP4)

Do Bulk sp. gr.

(Protocol P02)

& volumetrics

(AASHTO PP19)(keep specimens)

From 14 bags of plant mix, compact a total of 28 specimens, @5700 gm.

to 140 mm, as follows:

2 specimens @ 3% air voids

(to be shipped to NCAT)

26 specimens @ 7% air voids

3 specimens, do bulk sp. gr.

(2 to be shipped to NCAT

I to be shipped to LAW/NCDOT to be shipped to LAW/NCDOT

7 specimens 16 specimens

to be shipped to NCAT

SURFACE course:

Plant mix (3 pans). Usual NCDOT QA (keep specimens)

(Hot) Plant Mix (3 bags in one cooler) compact 6 GC specimens,

@ 4800 gm ea. @ N_{max} to 115 mm

(AASHTO TP4)

Do Bulk sp. gr.

(Protocol P02)

& volumetrics

(AASHTO PP19)(keep specimens)

From 24 bags of plant mix, compact a total of 28 specimens, @5700 gm.

to 140 mm, as follows

2 specimens @ 3% air voids

to be shipped to NCAT

26 specimens @ 7% air voids

3 specimens, do bulk sp. gr

ship to NCAT[2] & LAW/NCDOT[1] to be shipped to LAW/NCDOT

7 specimens

to be shipped to NCAT

SPS-9A/ R2500 A/ US 1 NB / Lee County Section 1 (PG 70-22 AC Binder) Alternative Superpave

What will BITUMINOUS LAB do? (Carson Clippard)

BASE Course

And do (a) Max sp. gr. (Protocol P03)
(b) Extraction (Protocol P04)

(c) Aggt. gradation (Protocol P14)

From 5 bags of Aggt. mix @ 50 lb., and one pail of 64-22 binder,

produce "Job Mix" asphalt mixture in the lab, separate 1 loose sample of 2000 gm.

and prepare 20 GC specimens as follows: (AASHTO TP 4)

6 specimens, 4800 gm @ N_{max} to 115 mm, do bulk sp. gr. (Protocol P02) and volumetrics (keep samples) (AASHTO PP19)

14 specimens, 5700 gm @ 7% air voids, to 140 mm

6 specimens: do bulk sp gr and moisture susceptibility (keep samples) (Protocol P05)

1 specimen: do bulk sp gr to be shipped to LAW/NCDOT to be shipped to LAW/NCDOT

Using the loose sample, do max. sp. gr. test. (need not keep) (Protocol P03)

BINDER course

From 15 bag plant mix: prepare 3 loose samples @ 2000 gm ea. (need not keep)

And do (a) Max sp. gr. (Protocol P03)
(b) Extraction (Protocol P04)

(c) Aggt. gradation (Protocol P14)

From 5 bags of Aggt. mix @ 50 lb, and one pail of 64-22 binder,

produce "Job Mix" asphalt mixture in the lab, separate 1 loose sample of 2000 gm.

and prepare 20 GC specimens as follows: (AASHTO TP 4)

6 specimens, 4800 gm @ N_{max} to 115 mm, do bulk sp. gr. (Protocol P02) and volumetrics (keep samples) (AASHTO PP19)

14 specimens, 5700 gm @ 7% air voids, to 140 mm

6 specimens do bulk sp gr and moisture susceptibility (keep samples) (Protocol P05)

1 specimen do bulk sp gr to be shipped to LAW/NCDOT

7 specimens to be shipped to LAW/NCDOT

Using the loose sample, do max. sp. gr. test. (need not keep) (Protocol P03)

SPS-9A/ R2500 A/ US 1 NB / Lee County Section 1 (PG 70-22 AC Binder) Alternative Superpave

What will BITUMINOUS LAB do? (Carson Clippard) (continued)

SURFACE course:

From ½ bag plant mix: prepare 3 loose samples @ 2000 gm ea. (need not keep)

And do (a) Max sp. gr. (Protocol P03)
(b) Extraction (Protocol P04)
(c) Aggt. gradation (Protocol P14)

From 5 bags of Aggt. mix @ 50 lb., and one pail of 70-22 binder,

produce "Job Mix" asphalt mixture in the lab, separate 1 loose sample of 2000 gm.

and prepare 20 GC specimens as follows: (AASHTO TP 4)

6 specimens, 4800 gm @ N_{max} to 115 mm, do bulk sp. gr. (Protocol P02) and volumetrics (keep samples) (AASHTO PP19)

14 specimens, 5700 gm @ 7% air voids, to 140 mm

6 specimens: do bulk sp gr and moisture susceptibility (keep samples) (Protocol P05)

1 specimen: do bulk sp gr to be shipped to LAW/NCDOT to be shipped to LAW/NCDOT

Using the loose sample, do max. sp. gr. test. (need not keep) (Protocol P03)

SPS-9A / 6.549001T / R2500 A / US 1 NB / Lee County Material Collection, Distribution and Testing Work Plan

What will ASPHALT LAB do? (Bill Medford) [as needed]

For each of the following:

Test Section 3 (PG 64-22) Superpave Test Section 2 (AC-20) NC Standard

Test Section 1 (PG 70-22) Alternative Superpave

For Base, Binder and Surface Courses, respectively, 1 quart corresponding to each layer:

Penetration @ 5° C	1 test, w/ 3 readings	(AASHTO T49)
Penetration @ 25°C	1 test, w/ 3 readings	(Protocol P22)
Penetration @ 46°C	1 test, w/ 3 readings	**
Viscosity @ 60°C	2 tests	(Protocol P25)
Viscosity @ 135°C	2 tests	,,
Specific gravity @ 16°C	2 tests	(Protocol P23)
Dynamic shear @ 3 temps	2 tests	(AASHTO TP5)
Brookfield viscosity @ 135°C	i test	(ASTM D 4402)
Brookfield viscosity @ 165°C	l test	"
Rolling thin film (RTFOT)		(AASHTO T240)
DSR on RTFOT residue @ 3 temps	2 tests	(AASHTO TP5)
PAV of RTFOT residue		(AASHTO PPI)
Creep stiffness of PAV residue (2 temps) 24 hr conditioning	2 tests	(AASHTO TPI)
Creep stiffness of PAV residue (2 temps)	2 tests	
DSR on PAV residue (3 temps)	2 tests	(AASHTO TP5)
Direct tension on PAV residue (2 temps)	2 tests	(AASHTO TP3)

SPS-9A / 6.549001T / R2500 A/ US 1 NB / Lee County Material Collection, Distribution and Testing Work Plan

SPECIMENS AND DATA NEEDED FROM CONTRACTOR:

For each of the following:

Section 3 (PG 64-22) Superpave Section 2 (AC-20) NC Standard Section 1 (PG 70-22) Alternative Superpave

For Base, Binder and Surface Courses, respectively:

Job Mix Design for each layer
All QC GC Specimens
All QC Data

SPS-9A / 6.549001T / R2500 A/ US 1 NB / Lee County Material Collection, Distribution and Testing Work Plan

DATA NEEDED FROM MARTIN MARIETTA

For each of the following:

Section 3 (PG 64-22) Superpave Section 2 (AC-20) NC Standard Section 1 (PG 70-22) Alternative Superpave

For Base, Binder and Surface Courses, respectively:

(In tabular form for aggregate. mixes of all 3 layers)

Gradation	(Protocol P14)
Sp. gr. of Coarse aggregate.	(Protocol P11)
Sp. gr. of fine aggregate.	(Protocol P12)
Coarse aggregate. angularity	(PennDOT TM621)
Fine aggregate. angularity	(ASTM C 1252)
Toughness	(AASHTO T 96)
Soundness	(AASHTO T 104)
Deleterious material	(AASHTO T 112)
Clay content	(AASHTO T 176)
Thin elongated particles	(ASTM D 4791)

SPS-9A / 6.549001T / R2500 A/ US 1 NB / Lee County Material Collection, Distribution and Testing Work Plan

DATA NEEDED FROM CITGO

For each of the following:

Section 3 (PG 64-22) Superpave Section 2 (AC-20) NC Standard Section 1 (PG 70-22) Alternative Superpave

For Base, Binder and Surface Courses, respectively:

(As available, from the following table)

Penetration @ 5° C	1 test, w/ 3 readings	(AASHTO T49)
Penetration @ 25 ° C	1 test, w/3 readings	(Protocol P22)
Penetration @ 46 ° C	1 test, w/3 readings	,,
Viscosity @ 60°C	2 tests	(Protocol P25)
Viscosity @ 135°C	2 tests	"
Specific gravity @ 16°C	2 tests	(Protocol P23)
Dynamic shear @ 3 temps	2 tests	(AASHTO TP5)
Brookfield viscosity @ 135°C	1 test	(ASTM D 4402)
Brookfield viscosity @ 165°C	1 test	••
Rolling thin film (RTFOT)		(AASHTO T240)
DSR on RTFOT residue @ 3 temps	2 tests	(AASHTO TP5)
PAV of RTFOT residue		(AASHTO PPI)
Creep stiffness of PAV residue (2 temps) 24 hr conditioning	2 tests	(AASHTO TPI)
Creep stiffness of PAV residue (2 temps)	2 tests	
DSR on PAV residue (3 temps)	2 tests	(AASHTO TP5)
Direct tension on PAV residue (2 temps)	2 tests	(AASHTO TP3)

SPS-9A / 6.549001T / R2500 A / US 1 NB / LEE COUNTY Material Collection. Distribution and Testing Work Plan

Section 3 (PG 64-22 AC Binder) SUPERPAVE (SHRP Section ID 370902) Section 2 (AC-20 Binder) SUPERPAVE (SHRP Section ID 370901) Section 1 (PG 70-22 AC Binder) SUPERPAVE (SHRP Section ID 370903)

	HOW MUCH?	TO WHOM?	WHAT FOR?
SUBGRADE			
Untreated subgrade	1 bag @ 10 kg.	Mehdi Haeri	Sieve Analysis Atterberg Limits Classification
	2 moisture jars	Mehdi Haeri	Natural Moisture content
Lime treated subgrade	1 bag @ 10 kg.	Mehdi Haeri	Sieve Analysis Atterberg Limits Classification
	2 moisture jars	Mehdi Haeri	Natural Moisture content

What will SOIL LAB do? (Mehdi Haeri)

From the 6 bags of Bulk sample @ 10 Kg. [2 bags per test section] do the following tests:

Sieve Analysis (Protocol P51)
Atterberg Limits (Protocol P43)

Classification (Protocol P52)

From the 12 jar samples [4 jars per test section] do the following tests:

Natural Moisture Content (Protocol P49)

Do Nuclear Density Tests on the untreated subgrade and on the lime treated surface @ 3 positions per test (monitoring) section (AASHTO T238-86)

SPS-9A / 6.549001T / R2500 A / US 1 NB / LEE COUNTY Material Collection, Distribution and Testing Work Plan

Section 3 (PG 64-22 AC Binder) SUPERPAVE (SHRP Section ID 370902) Section 2 (AC-20 Binder) SUPERPAVE (SHRP Section ID 370901) Section 1 (PG 70-22 AC Binder) SUPERPAVE (SHRP Section ID 370903)

What will the RESIDENT ENGINEER'S OFFICE do? (Fred Sykes)

Do Nuclear Density Tests @ 3 positions per test (monitoring) section on the (AASHTO T238-86)

Base Course
Binder Course
Surface Course
for the three test sections 1, 2, & 3

Take 5 point levels for the three test (monitoring) sections on Lime stabilized Subgrade finished surface Base Course Binder Course Surface Course

Do NCDOT Conventional Density Tests for the three test (monitoring) sections on Untreated subgrade

Lime stabilized Subgrade finished surface

Base Course

Binder Course

Surface Course

SPS-9A / 6.549001T / R2500 A / US 1 NB / LEE COUNTY Material Collection, Distribution and Testing Work Plan

Section 3 (PG 64-22 AC Binder) SUPERPAVE (SHRP Section ID 370902) Section 2 (AC-20 Binder) SUPERPAVE (SHRP Section ID 370901) Section 1 (PG 70-22 AC Binder) SUPERPAVE (SHRP Section ID 370903)

What will the GEOTECHNICAL UNIT do? (Bill Moore)

Do Shoulder Auger Probe to 6m depth on the subgrade @ 1 per test (monitoring) section, at the following Station Nos.:33+50, 55+50, and 94+00

SPS-9A / 6.549001T / R2500 A / US 1 SB / Lee County Material Collection, Distribution and Testing Work Plan

Section 6 (Multigrade PG 76-22) SUPERPAVE (SHRP Section ID 370960)

	How мисн?	To WHOM?	WHAT FOR?
Liquid Asphalt (from plant)	2 buckets	To MRL (QA Lab.)	(storage) Prepare 9 GC+1 loose mix
	1 quart	Medford	Binder testing
Blended Aggregate (from plant)	20 cloth bags @ 30 lb.	Carson	Prepare 9 GC+1 loose mix
Paver mix	3 pans	QA Lab	QA work
	3 bags (Hot!)	QA Lab	Prepare 6 GC samples
	1 half-bags	Carson	Analysis

SPS-9A / 6.549001T / R2500 A / US 1 SB / Lee County Material Collection, Distribution and Testing Work Plan

Section 5 (PG 64-22) SUPERPAVE (SHRP Section ID 370961)

	How Much?	То Wном?	WHAT FOR?
Liquid Asphalt (from plant)	4 buckets	1 to MRL (QA Lab.) 1 to Carson 2 for NCSU	(storage) Prepare 9 GC +1 loose mix FHWA Research Binder testing
Blended Aggregate (from plant)	20 cloth bags @ 30 lb 600 lb. on ground	Carson NCSU pick-up	Prepare 9 GC ±1 loose mix FHWA Research
Paver mix	3 pans 3+ bags (Hot!) 4 bags	QA Lab QA Lab Carson	QA work Prepare 6 GC samples Analysis

SPS-9A / 6.549001T / R2500 A / US 1 SB / Lee County Material Collection, Distribution and Testing Work Plan

Section 4 (SBR - PG 76-22) SUPERPAVE (SHRP Section ID 370962)

	How Much?	To Whom?	WHAT FOR?
Liquid Asphalt (from plant)	4 buckets 1 quart	1 fo MRL (OA Lab.) 1 to Carson 2 for NCSU Medford	Prepare 9 GC+1 loose mrs. FHWA Research Binder testing
Blended Aggregate (from plant)	20 cloth bags @ 30 lb. 600 lb. on ground	Carson NCSU pick-up	Prepare 9 GC +1 loose mr FHWA Research
Paver mix	3 pans 3+ bags (Hot!) 4 bags	QA Lab Carson	QA work Prepare 6 GC samples Analysis

SPS-9A / 6.549001T / R2500 A / US 1 SB / Lee County Material Collection, Distribution and Testing Work Plan

Section 3 (AC-20) HDS (SHRP Section ID 370963)

	How MUCH?	То Wном?	WHAT FOR?
Liquid Asphalt (from plant)	4 buckets I quart	1 to MRL (QA Lab.) 1 to Carson 2 for NCSU Medford	(storage) Prepare 9 GC +1 loose mix 1.2 FHWA Research Binder testing
Blended Aggregate (from plant)	10 buckets @ 50 lb 41 cloth bags @ 30 lb 600 lb. on ground	MRL (QA Lab.) 40 to Carson 1 to Mehdi NCSU pick-up	(storage) Run Aggregate analyses Prepare 9 GC +1 loose mix FHWA Research
Paver mix	3 pans 3 bags (Hot!) 4 bags	QA Lab QA Lab Carson	QA work Prepare 6 GC samples Analysis

SPS-9A / 6.549001T / R2500 A / US 1 SB / Lee County Material Collection, Distribution and Testing Work Plan

Section 2 (SBS - PG 76-22) SUPERPAVE (SHRP Section ID 370964)

	How MUCH?	го Wном?	WHAT FOR?
Liquid Asphalt (from plant)	4 buckets 1 quart	1 to MRL (QA Lab.) 1 to Carson 2 for NCSU Medford	(storage) Prepare 9 GC + Lloose mp. FHWA Research Binder testing
Blended Aggregate (from plant)	20 cloth bags @ 30 lb. 600 lb. on ground	Carson NCSU pick-up	Prépare 9 GC+1 loose mix
Paver mix	3 pans 3 bags (Hot!) 4 bags	QA Lab Carson	QA work Prepare 6 GC samples Analysis

SPS-9A / 6.549001T / R2500 A / US 1 SB / Lee County Material Collection, Distribution and Testing Work Plan

Section 1 (PG 70-22) SUPERPAVE (SHRP Section ID 370965)

	How MLCH?	To Whom?	- WHAT FOR?
Liquid Asphalt (from plant)	4 buckets	1 to MRL (QA Lab.) 1 to Carson 2 for NCSU	(storage) Prepare 9 GC +1 loose mix FHWA Research
	l quart	Medford	Binder testing
Blended Aggregate (from plant)	10 buckets @ 50 lb 41 cloth bags @ 30 lb.	MRL (QA Lab.) 40 to Carson 1 to Mehdi	(storage) Run Aggregate analyses Prepare 9 GC +1 loose mix
	600 lb on ground	NCSU pick-up	FHWA Research
Paver mix	3 pans	QA Lab	QA work
	3 bags (Hot!)	QA Lab	Prepare 6 GC samples
	4 bags	Carson	Analysis

APPENDIX D

Mix Design and JMF

Test Section 370901

Test Section 370902

Test Section 370903

Test Section 370960

Test Section 370961

Test Section 370962

Test Section 370963

Test Section 370964

Test Section 370965

Mix Design and JMF

North Bound

Core Test Section 370901

NC DOT Standard Mix with AC-20

HDS – Surface Course

HDB – Binder Course

HB - Base Course





NORTH CAROLINA DEPARTMENT OF TRANSPORTATION 370901 RALEIGH, NORTH CAROLINA 27611

HOT MIX ASPHALT JGB MIX FORMULA

LEE PAVING COMPANY

TYPE MIX: BCSC, TYPE HDS

SANFORD, NC

JOB MIX FORM NO: 97-292-022

EFFECTIVE DATE: 11-10-97

PLANT CERTIFICATION NO: B -033

PROJECT NO:

COUNTY:

AGGREGATE SOURCES AND BLEND PERCENTAGES

SUPPLIER	LOCATION/SOURCE	MATERIAL	BLEND (1)
~~~~~~~~~~	**********		
MARTIN MARRIETTA	LEMON SPRINGS QUARRY	78-M	47-0
MARTIN MARRIETTA	LEMON SPRINGS QUARRY	SCRGS.	33.0
LEE PAVING COMPANY	RAMBEAUT PITT	SAND	20.0

TOTAL 100-02

JMF COMBINED SIEVE SIZE	GRADATION 2 PASSING	ASPHALT CEMENT %(TOT) 5.0
		GRADE PG64-22
2 m		EST ASH
1 1/2"		MAX - SP - GV - 2 - 454
1 "		LABORATORY SP. GV. 2.331
3/4"	100	VOIDS IN TOTAL MIX % 5.0
1/2"	98	MIN• % COMPACTION 95•0
3/8"	95	MIX TEMPERATURE F. 300
NC. 4	65	FLOW (0.01 IN.) 10
8	50	STABILITY (LBS.) 3000
16	37	NON STRIP ADDITIVE ≈ 0.25
40	16	MODIFIER 2 0.00
80	10	
NC. 200	5•8	

ASPHALT CEMENT SUPPLIER: CITGO WILMINGTON

TACK COAT SUPPLIER : SPECS.

NON-STRIP ADD. SUPPLIER: ARR-MAZ AD-HERE LOS-6500

MODIFIER SUPPLIER :

COMMENTS: CHANGE MADE TO THE NO. 8 SIEVE.

DATE JMF VOID:

## N.C. DOT Materials and Test Unit

Asphalt Design Laboratory Raleigh, NC.

270901

## REPORT ON MIX DESIGN OF ASPHALT MIXTURE North Carolina Department Of Transportation

MD# 97-292

DATE SAMPLED:			DATE APPROV	ED:	5-3-97	<del></del>
PROJECT NO .			ASPHALT:	Citgo Wilming		AC - 20
CONTRACTOR ·	Lee Paving Co		ADDITIVE:	ARR-MAZ Ad-Hen	78-M Stone	(.25 %)
PLANT LOC.	Sanford, N.C		Martin Marietta	Lemon Springs	Regular Sc	
PLANT CERT. #.	B-033		Lee Paving Co.	<b>Bambeaut</b>	Natural Sai	_
DESIGNED BY SPECIFICATION	John Bonardi HDS		1			
MARSHALL.	285 °F 41	nch 75 Blows				
AC SPECIFIC GRA	<u>/ITY:</u> 1.6	030	1 ' !			

GRADA	ION	OF	MA	TERIA	15	US	ED
-------	-----	----	----	-------	----	----	----

MATERIAL	78M	Scrgs.	Sand	Behouse	RAP	BLEND	Spec.
PERCENT	47.0	33-32 <del>.0</del>	20:0	1.0	0.0	BEEND	Range
		100					
2"	100.0	100 0	100.0	100.0		100	100
1 1/2"	100 0	100.0	100.0	100.0		100	100
1"	100.0	100.0	100.0	100.0		100	100
3/4"	100 0	100.0	100.0	100.0	1	100	100
1/2"	100.0	100.0	100.0	100.0		100	98-100
3/8"	94 0	100.0	100.0	100.0		97	90-100
#4	25.0	100.0	100.0	100.0		65	57-78
#8	30	75.0	100.0	100.0		48	38-62
#16	10	53.0	91.0	100.0		37	27-48
#40	1.0	28.0	30,0	100.0		16	14-35
#80	10	18.0	12.0	100.0		10	7-15
<b>#2</b> 00	04	11.9	5.0	95.0		5.85.8	4.0-6 0
ELUT LOSS			5.0			1.0	0.0-4.0
AGG B S.G	2 816	2.832	2.625	2.700		2.824	
					EFF. S.G.	: 2.647	

## **FORMULATIONS**

	MIX #1	MIX #2	MIX #3	MIX #4	MIX #5	% RAP / % Virgin	0/100
% ASPHALT (TOTAL)	4.5	5.0	5,5	5.0	6.5	% AC In RAP:	
STABILITY-IDS	2919	2772	3189	3578	3498	% AC from RAP	0.0
FLOW-1/100 in	9.3	10 3	13.0	11.5	. 12.2	% AC Absorption	0.34
UNIT WEIGHT-Ibs./cu.ft	144 6	145 5	147.4	148,8	148.5	7% ASH:	
LAB SP GR (Marshall)	2.318	2 331	2.352	2.385	2.380	TSR % Retained :	91.1
MAX SP GR (Rice)	2 472	2 454	2 437	2.419	2.402	Ignition Fum Calibr.:	
% VOIDS-TOTAL MIX (VTM)	6.2	50	3.1	14	0.8	% AC (Optimum):	5,0
% SOLIDS-TOTAL MIX	93 8	95 0	90 9	98.B	99.1	Rice Specific Gravity:	
% EFFECTIVE AC CONTENT	4 18	4 68	5 18	5.68	6.18	Lab Specific Gravity:	2.331
% BY VOLUME OF AC (EFF.)	94	10.6	11.9	13.2	14.3	Percent Air Voids:	5.0
% SOLIDS-AGGREGATE	84 4	84 4	85,0	85.4	84.8	Percent VMA:	15.2
% VOIDS-AGG. (VMA)	158	15 8	14.9	14 6	15.2	Percent VFA:	70
% VOIDS FILLED WIAC (VFA)	603	679	79.9	90.4	94 1	Stability:	3000
COMMENTS						Flow: DUST/AC Ralio	10 -1.2B-
DESIGNED BY	A .		. ^		······································		4-9-

John Bonardi

APPROVAL

3-3-97

% AC from RAP

% AC ADDED

1.2-5.0

FROM

1000 C

## NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH, NORTH CAROLINA 27611

370901 HIDB

## HOT MIX ASPHALT JOB MIX FORMULA

LEE PAVING COMPANY

TYPE MIX: BCBC, TYPE HDB

PITTSBURG, NC

JOB MIX FORM NO: 96-081-953

EFFECTIVE DATE: 05-22-97

PLANT CERTIFICATION NO: B -044

PROJECT NO:

COUNTY:

## AGGREGATE SOURCES AND BLEND PERCENTAGES

SUPPLIER	LOCATION/SOURCE	MATERIAL	BLEND (%)
	****		
WAKE STONE	MUNCURE QUARRY	67	52.0
WAKE STONE WAKE STONE	MONCURE QUARRY	78M	10.0
LEE PAVING	MONCURE QUARRY RAMBEAUT PIT	SCRGS Sand	25-0 13-0

TOTAL 100-0%

JMF CO	MBINEU GRADATION SIZE * PASSING	ASPHALT CEMENT X(TOT) 4-3
		GRADE PG64-22
2	. **	EST ASH 0.3
1 1/	<b>'2"</b>	MAX. SP. GV. 2.576
1	. " 100	LABORATORY SP. GV. 2.447
3/	<b>'4"</b> 95	VOIDS IN TOTAL MIX X 5.0
1/	'2" <b>7</b> 8	MIN. % COMPACTION 95.0
3/	′8"	MIX TEMPERATURE F. 300
NO.	4	FLOW (0.01 IN.) 12
	8 34	STABILITY (LBS.) 1650
1	.6 25	NON STRIP ADDITIVE X 0.50
4	0 11	MODIFIER % 0.00
8	10	•
NO. 20	4.0	

ASPHALT CEMENT SUPPLIER: SPECS.
TACK COAT SUPPLIER: SPECS.

NON-STRIP ADD. SUPPLIER: AD-HERE - ARR-MAZ

MUDIFIER SUPPLIER :

COMMENTS: DECREASED AC TO INCREASE VTM BASED ON QA/QC FIELD TEST.

PATE JMF VOIDS

APPROVED BY:

J.E. GRADY. JR.

D-01-3 PAVEMENT CONSTRUCTION ENGR.

**REVISED 3-20-00** 

## NORTH CAROLINA DEPARTMENT OF TRANSPORTATION MATERIALS AND TESTS UNIT RALEIGH, NORTH CAROLINA

MAT FORM 601

C. Chygrand

## REPORT ON MIX DESIGN OF ASPHALT MIXTURE North Carolina Department Of Transportation

MD# 96-081

DATE SAMPLED:		DATE APPROVED: 4-24-96
ESIGNED BY: SPECIFICATION:	Chatham Lee Paving Moncure & Pittsboro NCDOT	ASPHALT: AC-20 Citgo-Wilmington ADDITIVE: 0.5% AD-here  Wake Stone - Moncure #67 Stone Wake Stone - Moncure 78-M Stone Wake Stone - Moncure Scrg Rambeaut Sand
INC SPECIFIC GR	AVITY: 1.03	

GRADATION OF MATERIALS USED									
MATERIAL	#67	78-M	Scrg	Sand	T			BLEND	TARGET
PERCENT	52	10	25	13					TANGET
2*				-	┼				
1 1/2°				Ti			-	<del>                                     </del>	] }
1.	100				<del>                                     </del>	_		100	100
3/4*	95				1			97	90-100
1/2"	57	100		7				78	67-78
3/8*	34	95	100		1			/ 0	0.7-78
#4	10	27	98		<del>                                     </del>			<del></del>	
#8	2	4	77	100				34	25-45
#16	1	ı	49	91	<del>                                     </del>				18-34
#40	1	1	27	30	1				11-23
#80					<del>                                     </del>			<del>                                     </del>	11-23
#200	0.7	0.4	11.5	4.5	<b>†</b>			4.0	3-5
ELUT. LOSS	-	_	-	4.5	1			0.6	7-2
AGG. B.S.G.	2.77	2.72	2.74	2.59				2.733	
							EFF S.G.:	2.740	

#### **FORMULATIONS** MIX #1 MIX #2 **MIX #3** MIX #5 MIX #4 % RAP / % Virgin: 0/100 ASPHALT (TOTAL) 5 - 5 . 0 6.0 6.5 % AC in RAP: STABILITY-lbs. 1562 1766 1764 1782 2151 % AC from RAP FLOW-1/100 in. 11.8 12.0 12.3 11.2 % AC Absorption: UNIT WEIGHT-lbs./cu.ft. 148.8 150.1 151.4 152. 3 | 152.6 % ASH: 0.3 LAB SP. GR. (Marshall) 384 2.405 .427 440 2.445 TSR % Retained: MAX. SP. GR. (Rice) 2.550 2.530 2.511 2.492 | 2.473 Ignition Furn. Calibr.: % VOIDS-TOTAL MIX (VTM) 4.9 3.4 % AC (Optimum): 5.0 % SOLIDS-TOTAL MIX 93.5 95.1 96.6 97.9 98.9 Rice Specific Gravity: 2. 630 % EFFECTIVE AC CONTENT 4.41 4,91 5.41 5.91 6.41 Lab Specific Gravity: 2,404 % BY VOLUME OF AC (EFF.) 10.2 11.5 15 Percent Air Voids: 14.0 . 5.0 % SOLIDS-AGGREGATE 83.3 83.6 83.9 83.9 Percent VMA: 83.7 16.4 % VOIDS-AGG. (VMA) 16.7 16.4 Percent VFA: 16.1 16.1 16.4 20.1 % VOIDS FILLED W/AC (VFA) 78.9 87.0 192 Stability: 650 COMMENTS: Flow: 0.82 **DUST/AC Ratio:** PESIGNED BY: % AC TOTAL: 5.0 % AC from RAP. APPROVAL: D-01-4 % AC ADDED:

120 SK

## NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH, NORTH CAROLINA 27611

## HOT MIX ASPHALT JOB MIX FORMULA

LEE PAVING COMPANY

TYPE MIX: BCBC. TYPE HB

MONCURE, NC

JOB MIX FORM NO: 96-118-052

EFFECTIVE DATE: 01-06-97

PLANT CERTIFICATION NO: B -187

PROJECT NO:

COUNTY

### AGGREGATE SOURCES AND BLEND PERCENTAGES

SUPPLIER	LOCATION/SOURCE	MATERIAL	BLEND (%)
*******			
WAKE STONE	MONCURE QUARRY	#5	35.0
WAKE STONE	MONCURE QUARRY	· #67	24-0
WAKE STONE	MONCURE QUARRY	SCRGS	31-0
LEE PAVING	RAMBEAUT PIT	SAND	10.0

TOTAL 100-0%

MF COMBIN		ASPHALT CEMENT %(TO	T) 4.2
		GRADE . P	G64-22
2 "	100	EST ASH	0.5
1 1/2"	95	MAX. SP. GV.	2-562
1 "		LABORATORY SP. GV.	2.434
3/4"	77	VOIDS IN TOTAL MIX	× 5.0
1/2"	• •	MIN- % COMPACTION	92-0
3/8"		MIX TEMPERATURE F.	300
NO. 4	43	FLOW (0.01 IN.)	16
8	35	STABILITY (LBS.)	3650
16	25	NON STRIP ADDITIVE	x 0.50
40	12	MODIFIER X	0.00
• •	16	110021261	
80	4.3		
NO. 200	4.3		

ASPHALT CEMENT SUPPLIER: SPECS.
TACK COAT SUPPLIER: SPECS.
NON-STRIP ADD. SUPPLIER: AD-HERE

MODIFIER SUPPLIER

COMMENTS:

DATE JMF VOID:

APPROVED BY:
J.E. GRADY, JR.
PAVEMENT CONSTRUCTION ENGR.

REVISED 3-20-06

## NORTH CAROLINA DEPARTMENT OF TRANSPORTATION MATERIALS AND TESTS UNIT



RALEIGH, NORTH CAROLINA

370901 HB

## REPORT ON MIX DESIGN OF ASPHALT MIXTURE North Carolina Department Of Transportation

MD#96-118

DATE SAMPLED: 3-11-96 DATE APPROVED: 6-6-96 PROJECT NO.: 6.409010T ASPHALT: AC-20 Citgo-Wilmington ADDITIVE: 0.5% AD-here :YTNUOS Chatham CONTRACTOR: Lee Paving Wake Stone-Moncure #5 Stone Wake Stone-Moncure #67 Stone LANT: Moncure & Pittsboro DESIGNED BY: NCDOT SPECIFICATION: HB Wake Stone-Moncure Scrg 6"-75 Blow-291F MARSHALL: Rambeaut Sand

IAC SPECIFIC GRAVITY: 1.03

## **GRADATION OF MATERIALS USED**

IATERIAL	#5	#67	Scrg	Sand			BLEND	TARGET
PERCENT	35	24	31	10				
								100
. 1/2"	100						100	95-100
1"	98	100					99	
'4"	38	95					77	68-82
2"		57						
3/8*	1	34	100					
\$	1	10	98	100			43	32-48
3		2	77	98			35	26-44
#16	1	1	49	92			25	20-32
#40	1	1	27	30			12	11-20
80								
_L 200	0.3	0.7	11.5	3.7			4.3	3-5
ELUT. LOSS	-	-	-	3.7			0.4	
3G. B.S.G.	2.83	2.77	2.74	2.59			2.762	
					,	EFF S	.G.: 2.765	

### **FORMULATIONS**

	MIX #1	MIX #2	MIX #3	MIX #4	MIX #5	% RAP / % Virgin:	0/1100
ASPHALT (TOTAL)	4.0	4.5	5.0	5.5	6.0	% AC in RAP:	
STABILITY-Ibs.	3245	3856	3781	4117	4331	% AC from RAP	
⊯LOW-1/100 in.	15	16	17	18	20	% AC Absorption:	0.04
NIT WEIGHT-lbs./cu.ft.	150.2	152.0	152.9	154.0	154.7	]% ASH:	0.5
LAB SP. GR (Marshall)	2.407	2.436	2.450	2.468	2.479	TSR % Retained:	
MAX. SP. GR. (Rice)	2.590	2.570	2.550	2.530	2.511	Ignition Furn Calibr.:	
% VOIDS-TOTAL MIX (VTM)	7.1	5.2	3.9	2.5	1.3	% AC (Optimum):	47
% SOLIDS-TOTAL MIX	92.9	94.8	96.1	97.5	98.7	Rice Specific Gravity:	2.562
1% EFFECTIVE AC CONTENT	4.0	4.5	5.0	5.5_	6.0	Lab Specific Gravity:	2.434
BY VOLUME OF AC (EFF)	9.3	10.5	11.8	13.1		Percent Air Voids:	. 5.0
SOLIDS-AGGREGATE	83.6	84.3	84.3	84.4	84.4	Percent VMA:	13.8
% VOIDS-AGG (VMA)	16.3	15.8	10./	15.6	10.0	Percent VFA:	70
6 VOIDS FILLED W/AC (VFA)	57.1	66.5	75.2	84.0	91.7	Stability:	3650
OMMENTS.						Flow:	16
						DUST/AC Flatio	0.91
SIGNED BY:						% AC TOTAL:	4.7
1		% AC from RAP:					
APPROVAL:	COOL		a D	5		% AC ADDED:	

D-01-6

## Mix Design and JMF

## **North Bound**

**Core Test Section 370902** 

Superpave Mix with PG 64-22

Surface Course - 12.5 mm

Binder Course - 19.0 mm

Base Course - 37.5 mm

370002 surfac

### CORRECTED COPY

#### NORTH CAROLINA DEPARTMENT OF TRANSPORATION RALEIGH, NORTH CAROLINA 27611

#### SUPERPAVE HOT MIX ASPHALT JOB MIX FORMULA

TYPE MIX: ACBC, TYPE SP 12.5 LEE PAVING COMPANY

JOB MIX FORM NO: 97-442-021 SANFORD NC

EFFECTIVE DATE: 05-09-97

PLANT CERTIFICATION NO.: B-033 PROJECT NO: 6.549001T

COUNTY: LEE-CHATHAM

#### AGGREGATE SOURCES AND BLEND PERCENTAGES

SUPPLIER	LOCATION/SOURCE	MATERIAL	BLEND (%)
MARTIN MARIETTA	LEMON SPRINGS QUARRY	#67	15.0
MARTIN MARIETTA	LEMON SPRINGS QUARRY	#78M	55.0
MARTIN MARIETTA	LEMON SPRINGS QUARRY	REG. SCRGS.	20.0
LEE PAVING COMPANY	RAMBEAUT PIT	N. SAND	10.0

TOTAL 100.0%

JMF COMBIN	NED GRADATION	*ASPHALT BINDER % (TOT)	5.2
SIEVE SIZE	E % PASSING		
2 " (5	0.0 mm)	GRADE	PG 64-22
1 1/2" (3	7.5 mm)	MAX. SP. GR.	2.464
1" (2:	5.0 mm)	GYRATORY SP. GR.: Gmb@Nd	2.356
3/4" (1	9.0 mm) 100	VOIDS IN TOTAL MIX &	4.0
1/2" (1:	2.5 mm) 94	VOIDS IN MIN. AGG. %	14.8
3/8" (9	.5 mm) 84	VOIDS FILLED W/ASPH %	73
No. 4 (4	.75 mm) 43	MIN. & COMPACTION & G	92.0
•	.36 mm) 29	MIX TEMPERATURE F.	300
•	.18 mm) 23	NON-STRIP ADDITIVE %	0.25
•	.600 mm) 17	MODIFIER %	0.00
· · · · · · · · · · · · · · · · · · ·	.300 mm) 9	$N_{ini}/N_{des}/N_{max}$	8/106/169
No. 100 (0	).150 mm) 7		
No. 200 (0	•		

ASPHALT CEMENT SUPPLIER : CITGO WILMINGTON

TACK COAT SUPPLIER : SEACO, COLUMBIA, SC CRS-1 NON-STRIP ADD. SUPPLIER : AD-HERE - ARR MAZ LOF 65-00

COMMENTS:

APPROVED BY:

J. E. GRADY, JR., PE

D-02-1 PAVEMENT CONSTRUCTION ENGINEER

P.O. BOX 37 GARNER, NC 27529

						r	n D 97-1	444
TE SUBMIT	TED:	14-Apr-97			DATE APPR	OVED:	5-9-	97
ECT NO.	: 6	.549001	7		ASPHALT:		Citgo PG64-	22
DUNTY:		Lee	•		ADDITIVE:	_	Adhere 65-06	025%
RACTOR	R: Lee	Paving Comp	any		Martin Marie	Ita	L. Springs	#67m
_Α <b>ΙΙ</b> Γ:	F	Pea Ridge Roa	d		Martin Marie	tta	L. Springs	#78m
SIGNED BY	<b>/</b> :	Sam Johnson			Martin Marie	tta	L. Springs	Semps
-CATICATIO	ON:	Superpave 12	.5mm					
TIONS:		8/106/169	6 inch	292*F	Rambeaut		Natural	Sand
SPECIFIC	GRAVITY	<b>':</b>	1.030		Lee Paving		Sanford	Bagfines
AEEIN MARI			97A.335					
SSING	i	L. Springs	L. Springs	L Springs	0	Natural	Sanford	Combined
SIEVE	(mm)	#67m	#78m	Scrngs	0	Sand	Bagfines	Gradation
		15%	55%	19%		10%	1%	100%
2"	50	100.0	100.0	100.0		100.0	100.0	100.0
1 1/2"	37.5	100.0	100.0	100.0		100.0	100.0	100.0
in.	25.0	100.0	100.0	100.0		100.0	100.0	100.0
in.	19.0	100.0	100.0	100.0		100.0	100.0	100.0
1/∠ in.	12.5	62.0	99.0	100.0		100.0	100.0	93.8
248 in.	9.5	30.0	90.0	100.0		100.0	100.0	84.0
14	4.75	5.2	23.0	99.0		99.9	100.0	43.2
<b>#8</b>	2.36	2.1	4.0	83.0		99.7	100 0	29.3
16 j	1.18	1.5	3.0	57.0		94.0	100.0	23.1
30	0.600	1.0	2.0	40.0		70.0	100 0	16.9
50	0.300	10	1.0	27 0	İ	22.0	100 0	9.0
#100	0.150	0.8	1.0	19.0		12.0	100 0	6.5
500	0.075	0.6	0.5	13.0		6.6	95 0	4.4
਼ <b>ਤਾਂ</b> . Buik D	Ŋ	2.654	2.631	2.639		2.574	2.700	2.631
Gr. Appare	ent	2.705	2.694	2.680		2.640	2.700	2.688
.s ition %(		0.70	0.90	0 60		0 97	1.0	1
-AC Conte		5.02%	(initial)			RICE EFFEC		<u> </u>
_		Rice Effective	2'684	Vol	umetric at N d			<del>-</del> '
A HALT			502%	4.67%	5.17%	5.67%	6.17%	% AC Absorp.
ie Gravit	ty		2,380:	2.354	2.364	2.372	2.375	0.54%
Specific (	Gravity		2.468	2.483	2.465	2.447	2.429	RAP Information
iii 'eight			747:31:55	146 9	147.5	148 0	148 2	% AC IN RAP
Sads Total	Mix		95:6%	94.8%	95.9%	97.0%	97.8%	0.0
Voids Total	Mix		4.4%	5 2%	4 1%	3.0%	2.2%	% AC from RAP
by olume of	of AC		10.4%	9.4%	10.6%	11.8%	13.0%	0.0
Sads of Aq	g. Only		85.3%	85.3%	85.3%	85 1%	84 8%	Tensile Strength
Voids of Age	g. Only		14.8%	14.7%	14.8%	14 9%	15 3%	
V <b>∰</b> s Filled	w/Aspn		70.4%c. r	64 6%	72.3%	79.6%	85 5%	% Asphalt
DLLL/AC			0.98%	1 08%	0.96%	0 87%	0 79%	
AC CON			4.52%	4 13%	4 63%	5 13%	5 63%	%AC(Des ) 5./
	(%Gmm)	8	86,7%	85 8%	86.5%	87 2%	87 7%	Rice Gr
	(%Gmm)	106	95.6%:	94.8%	95.9%	97 0%	97.8%	Lab Gri
	(%Gm <b>/n</b> )	169	[FFF-86:9%: #-]	96 0%	97 3%	98.3%	991%	Air Voids
signed By:	Sam	1			Comments:	CAA-400/40	2	VMA _
្រុក ad By:	Dan		<del></del>		]SE=46 ]FAA=47	CAA=100/10	J	VFA:
رود دو د	J. B.	70.00°	21 Da.	5-9-97	Flat and Eion	a.=0		1000 M 70
	<u> </u>	(10)		D-(	)Z-Z	<u> </u>		MLR-10 (3/97)
		_	1					· · · · · · · · · · · · · · · · · · ·

#### NORTH CAROLINA DEPARTMENT OF TRANSPORATION RALEIGH, NORTH CAROLINA 27611

52

#### SUPERPAVE HOT MIX ASPHALT JOB MIX FORMULA

LEE PAVING COMPANY TYPE MIX: ACBC, TYPE SP 19.0

SANFORD NC JOB MIX FORM NO: 97-441-021

EFFECTIVE DATE: 05-09-97

PLANT CERTIFICATION NO.: B-033 PROJECT NO: 6.549001T

COUNTY: LEE-CHATHAM

#### AGGREGATE SOURCES AND BLEND PERCENTAGES

SUPPLIER	LOCATION/SOURCE	MATERIAL	BLEND (%)
MARTIN MARIETTA	LEMON SPRINGS QUARRY	#67	50.0
MARTIN MARIETTA	LEMON SPRINGS QUARRY	#78M	22.0
MARTIN MARIETTA	LEMON SPRINGS QUARRY	REG. SCRGS.	18.0
LEE PAVING COMPANY	RAMBEAUT PIT	N. SAND	10.0

TOTAL 100.0%

JMF COM	BINED GRADA	ATION	*ASPHALT BINDER % (TOT)	4.7
SIEVE S	IZE	% PASSING		
2 "	(50.0 mm)	<u> </u>	GRADE	PG 64-22
1 1/2"	(37.5 mm)		MAX. SP. GR.	2.483
1"	(25.0 mm)	100	GYRATORY SP. GR.: Gmb@Nd	2.384
3/4"	(19.0  mm)	99	VOIDS IN TOTAL MIX %	4.0
1/2"	(12.5 mm)	80	VOIDS IN MIN. AGG. %	14.0
3/8"	(9.5 mm)	62	VOIDS FILLED W/ASPH %	70
No. 4	(4.75  mm)	35	MIN. % COMPACTION % G	92.0
No. 8	(2.36 mm)	27	MIX TEMPERATURE F.	300
No. 16	(1.18 mm)	22	NON-STRIP ADDITIVE %	0.25
No. 30	(0.600 mm)	16	MODIFIER %	0.00
No. 50	(0.300 mm)	9	$N_{ini}/N_{des}/N_{max}$	8/106/169
No. 100	(0.150 mm)	6		
No. 200	(0.075 mm)	4.2		

ASPHALT CEMENT SUPPLIER : CITGO WILMINGTON

TACK COAT SUPPLIER : SEACO, COLUMBIA, SC CRS-1 NON-STRIP ADD. SUPPLIER: AD-HERE - ARR MAZ LOF 65-00

COMMENTS:

APPROVED BY:

J. E. GRADY, JR., PE

PAVEMENT CONSTRUCTION ENGINEER

DATE JMF VOID:

P.O. BOX 37 GARNER, NC 27529

370902

mp97-441

					<del></del>		MO911-	
DATE SUBMIT	TED:	14-Apr-97			DATE APPRO	VED:	5-7	
PRUECT NO.	: 6	.549001	・		ASPHALT:		Citgo PG84-2	22
COUNTY:		Lee			ADDITIVE:		Adhere 65-00	
CONTRACTOR		Paving Compa			Martin Manetta		L. Springs	#67 ¹
PLENT:		ea Ridge Road	1		Martin Manetta		L. Springe	<b>#</b> 78
DESIGNED BY	<b>/</b> :	Sam Johnson			Martin Marietta	1	L. Springs	Scrigs
SPECIFICATIO	ON: S	Superpave 19.	0mm					<b>T</b>
G .TIONS:		8/106/169	8 inch	292 <b>*</b> F	Rambeaut		Natrual	Sand
AL SPECIFIC	GRAVITY:		1.030		Lee Paving		Sanford	Bagfines
MARTIN MAR			97A.331		•			
SSING		L. Springs	L. Springs	L Springs	0	Natrual	Sanford	Combined
J.EVE	(mm)	#67	#78	Scrngs	0	Sand	Bagfines	Gradation
		50%	22%	17%		10%	1%	100%
2*	50	100.0	100.0	100.0		100.0	100.0	100.0
1/2"	37.5	100.0	100.0	100.0		100.0	100.0	100.0
1 in.	25.0	100.0	100.0	100.0		100.0	100.0	100.0
4 in.	19.0	98.0	100.0	100.0		100.0	100.0	B9.0
2 in.	12.5	61.0	99.0	100.0		100.0	100.0	B0.3
3/8 in.	9.5	29.0	90.0	100.0		100.0	100.0	B2.3
#4	4.75	5.0	23.0	99.0		99.9	100.0	35.4
#8	2.36	2.0	4.0	83.0		99.7	100.0	27.0
#16	1.18	1.5	3.0	57.0		94.0	100,0	21.5
#30	0.600	1.0	2.0	40.0		70.0	100 0	N 5.7
#50	0.300	1.0	1.0	27.0	İ	22.0	100.0	18.5
#100	0.150	0.8	1.0	19.0		12.0	100.0	6.1
#200	0.075	0.6	0.5	13.0	1	6.6	95.0	14.2
S Gr. Bulk	<u> </u>	2.654	2.631	2.639		2.574	2.700	2.639
Sp. Gr. Appar	•	2.705	2.694	2.680		2,640	2.700	2.692
Amorption, %		0.70	0.90	0.60		0.97	1 0	
in al AC Cont		4.48%				RICE EFFEC		2.669
		Rice Effective:	(initial) 2665	<u>Voi</u>	umetric at N de			
% SPHALT			4.48%	4.10%	4.60%	5.10%	5.60%	% AC Absorp.
S cific Grav	rty		7381	2.355	2.380	2.394	2.397	0.45%
Max. Specific			2,4887	2.506	2.487	2.469	2.451	RAP Information
Uest Weight			#######################################	148.9	148.5	149.4	149 6	% AC In RAP
olids Tota	I Mix		95-7%	94.0%	95.7%	97.0%	97.8%	0.0
% Voids Total	Mix		3%	6.0%	4 3%	3.0%	2.2%	% AC from RAP
%_by Volume	of AC		9.5%	8.3%	9.6%	10.8%	12.0%	0.0
% Solids of A			86.2%	85.6%	86.1%	86.2%	85.8%	Tensile Strengt
% Voids of A			E-13.8%	14 4%	13.9%	13.9%	14 2%	
Voids Fille			68:75	58.2%	69.1%	78.1%	84 6%	% Asphatt
% ust/AC			1.03%	1.16%	1.02%	0.91%	0.82%	
EFF AC CO			4:00%		4.15%	4 65%	5.15%	%AC(Des.)4
N intial	(%Gmm)		862756		86.8%	87.4%	87.9%	Rice Gr
N esign	(%Gmm)		95-796		95.7%	97.0%	97.8%	Lab Gr.
V paximum		169	97,0%	95.2%	97.0%	98.3%	99.2%	Air Voids
Designed By:		(/			Comments	C. A = 455 145		VMA:
	2 an	( )	hear		SE=50 - FAA=47	CAA=100/10	10	VFA:
ved By:		(11):m	a 6) Chr	5-7-97	Flat and Sono	=0		Dust/AC: 2.96
	C. H.	KINGU	is The	2-1-11	Flat and Sono	; =0	· · · · · · · · · · · · · · · · · · ·	1

D-02-4

70

## NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH, NORTH CAROLINA 27611

#### SUPERPAVE HOT MIX ASPHALT JOB MIX FORMULA

LEE PAVING COMPNAY TYPE MIX: ACBC, TYPE SP 37.5

SANFFORD, NC JOB MIX FORM NO.: 97-440-021

EFFECTIVE DATE: 05-08-97

PLANT CERTIFICATION NO.: B-033 PROJECT NO.: 6.549001T

COUNTY: LEE-CHATHAM

#### AGGREGATE SOURCES AND BLEND PERCENTAGES

SUPPLIER	LOCATIO	ON/SOURCE MATERIAL	BLEND %
MARTIN MARIETTA	LEMON	SPRINGS QUARRY #4	20.0
MARTIN MARIETTA	LEMON	SPRINGS QUARRY #5	31.0
MARTIN MARIETTA	LEMON	SPRINGS QUARRY #67	15.0
MARTIN MARIETTA	LEMON	SPRINGS QUARRY #78m	11.0
MARTIN MARIETTA	LEMON	SPRINGS QUARRY R.SCRGS.	23.0
		TOTAL	100.0%
JMF COMBINED GRADA	TION	*ASPHALT BINDER % (TOT)	4.5
SIEVE SIZE % PA	ASSING		
2 " (50.0 mm)	100	GRADE	PG 64-22
1 1/2" (37.5 mm)	99	MAX SP. GR.	2.487
1 " (25.0 mm)	89	GYRATORY SP. GR.: Gmb@Na	2.388
3/4" (19.0 mm)	68	VOIDS IN TOTAL MIX %	4.0
1/2" (12.5 mm)	46	VOIDS IN MIN. AGG. %	14.2
3/8" (9.5 mm)	39	VOIDS FILED W/ASPH %	70
No. 4 (4.75 mm)	27	MIN. % COMPACTION % Gmm	92.0
No. 8 (2.36 mm)	21	MIX TEMPERATURE F.	300
No. 16 (1.18 mm)	15	NON-STRIP ADDITIVE %	0.25
No. 30 (0.600 mm)	11	MODIFIER %	0.00
No. 50 (0.300 mm)	8	Nini/Ndes/Nmax	8/106/169
No. 100 (0.150 mm)	6		

ASPHALT CEMENT SUPPLIER: CITGO WILMINGTON

TACK COAT SUPPLIER : SEACO, COLUMBIA, SC CRS-1 NON-STRIP ADD. SUPPLIER: ARR-MAZ AD-HERE LOF 65-00

COMMENTS:

APPROVED BY:

J. E. GRADY, JR.

DATE JMF VOID:

No. 200 (0.075 mm) 4.2

PAVEMENT CONSTRUCTION ENGR.

## FROM MARTIN MARIETTA MAT'L LAB TO

## MARTIN MARIETTA AGGREGATES MATERIALS LABORATORY

P.O. BOX 37 GARNER, NC 27529

D. E SUBMIT	TED:	14-Apr-97			DATE APPRO	OVED: MO	97-4	40
PROJECT NO		549001T			ASPHALT:		Citgo PG64-	
COUNTY:	9.		hotham		ADDITIVE:		Adhere LOF	:
CENTRACTO	D. 100	Paving Comp			Martin Manett			
PLAT:		Pea Ridge Roa	•		Martin Mariett		L. Springs	#5
DESIGNED BY		Sam Johnson	<b>u</b>		Martin Mariett		L. Springs L. Springs	#67
IFICATIO	ON:	Superpave 37.		2001 5	Martin Mariett		L. Springs	#78m
TIONS.		8/106/169	6 inch	292* F	Martin Mariett	.8	L. Springs	Reg.Scmgs
AC SPECIFIC			1.030		Lee Paving		Senford	Bagfines
MERTIN MAR	IETTA LA	B NUMBER:	97A.338					
% PASSING		L Springs	L. Springs	L. Springs	L. Springs	L. Springs	Sanford	Combined
SIEVE	(mm)	#4	#5	#67	#78m	Reg.Scmgs	Bagfines	Gradation
		20%	31%	15%	11%	22%	1%	100%
2"	50	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1 1/2"	37.5	99.0	100.0	100,0	100.0	100.0	100.0	8.99
1 in.	25.0	50.0	98.0	100/0	190.0	/ 100.0	100.0	88.8
3/4 in.	19.0	14.0	52.0	98/0 /	100.0	100.0	100.0	67.6
1/2 in.	12.5	<i>\$</i> .0	5.0	81.0 /	99.0	100.0	100.0	45.6
3/8 in.	9.5	/2.0	_3.0	29.0	90.0	100.0	100.0	38.6
#4	4.75	/ 1.0	2.0	50	23.0	99.0	100.0	26.9
#8	2.36	/ 1.0	/ 1.a	20	4.0	83.0	100.0	20.5
#18	1.18	/ 1.0	1.0	1/5	3.0	57.0	100.0	14.6
#30	0.600	1.0	1.0	1.0	2.0	40.0	100.0	10.7
#50	0.300/	1.0	1.0	1.0	1.0	27.0	100.0	7.7
-	0.150	0.8	8.6	0.8	1.0	\ 19.0	100.0	5,8
#100	0.139	0.8	0.4	0.6	0.5	13.0	95.0	4.2
#200	<u> </u>	<u> </u>	2.668	2.654	2.631		<u> </u>	
Sp. Gr. Bulk D	- 1	2.670				2.639	2.700	2.656
Sp. Gr. Appare	_	2.715	2.710	2.705	2.694	`2.680	2.700	2.702
Al orption, %		0.50	0.60	0.70	0.90	0.60	1.00	<b>.i</b>
Intral AC Cont	ent:	3.53%	(Initial)			RICE EFFEC	TIVE:	2.665
		Rice Effective:	267		<u>imetric at N de</u>	esian		
% SPHALT			3:53%	3.40%	3.90%	4.40%	4.90%	% AC Absorp.
Specific Gravi	ty		2.393	2.355	2.376	2.383	2.390	0113%
Max. Specific	Gravity		<b>第一2.517</b> :57	2.529	2.510	2.491	2.473	RAP Information
Ul Weight			=====49:3:1:::	147.0	148.2	148.7	149.1	% AC IN RAP
% olids Total			##95,1%	93.1%	94.7%	95.7%	96.6%	0.0
% Voids Total	Mix		4:9%F##	6.9%	5 3%	4.3%	3.4%	% AC from RAP
Volume	of AC		# 1 8.2%	7.5%	8.7%	9.9%	11.1%	0.0
ds of Ac	g. Only		86.9%	85.7%	86.0%	85.8%	85.6%	Tensile Strength
% Voids of Ag			<b>三世13.1%</b>	14.3%	14.0%	14.2%	14.4%	
% Holds Filled			82.4%	52.2%	62.0%	69.6%	76.7%	% Asphalt
% Ist/AC			448%进	1.27%	1.10%	0.97%	0.87%	
EFF AC CON	TENT		₩#3151%6D.	3 27%	3 77%	4.27%	4.77%	%AC(Des ). 4.5
N <u>intial</u>	(%Gmm)	8	### 85.5% HE	83.4%	84.7%	85.0%	85.8%	Rice G
N sign	(%Gmm)	106	35.1%	93.1%	94.7%	9 <b>5</b> .7%	96.6%	Lab Gr
Nximum	(%Gn/m)	168	96,6%	94.6%	96.3%	97 3%	98.4%	Air Voids
Designed By:	V	////			Comments:			VMA:
	San	1 Likes	h	***	FAA=50	CAA=100/100	•	VFA:
/ed By:	NI	M. ~	QQ	5/1/00	SE=60			DustAC 0.96
	-14.	Kunta	ide for :	-14/4.1	Flat and Elone	g.@5:1=0		
		00	. 1	D-02-	6			ı

## **North Bound**

**Core Test Section 370903** 

Alternate Superpave Mix with PG 70-22

Surface Course - 12.5 mm

Binder Course - 19.0 mm

Base Course – 37.5 mm

## NORTH CAROLINA DEPARTMENT OF TRANSPORTATION FINAL

HANA 370903

#### SUPERPAVE HOT MIX ASPHALT JOB MIX FORMULA

LEE PAVING COMPNAY TYPE MIX: ACSC, TYPE SP 12.5

SANFORD, NC JOB MIX FORM NO.: 97-493-021

EFFECTIVE DATE: 06-05-97

PLANT CERTIFICATION NO.: B-033 PROJECT NO.: 6.549001T

COUNTY: LEE-CHATHAM

#### AGGREGATE SOURCES AND BLEND PERCENTAGES

SUPE MARTIN M MARTIN M MARTIN M LEE PAVI	ARIETTA ARIETTA ARIETTA	LEMON SPR	OURCE MI INGS QUARRY INGS QUARRY INGS QUARRY	#67M #78M	BLEND % 15.0 55.0 20.0 10.0
				TOTAL	100.0%
JMF COME	SINED GRADAT:	ION SSING	*ASPHALT BIN	DER % (TOT)	5.1
2 "	(50.0 mm) 10	00	GRADE		PG 70-22
1 1/2"	(37.5 mm) 10	00	MAX SP. GR.		2.468
1 "	(25.0 mm) 10	00	GYRATORY SP.	GR.: Gmb@Nd	2.369
3/4"	(19.0 mm) 10	00	VOIDS IN TOT	AL MIX %	4.0
1/2"	(12.5 mm)	94	VOIDS IN MIN	I. AGG. %	14.8
3/8"	(9.5 mm) 8	84	VOIDS FILED	W/ASPH %	72
No. 4	(4.75 mm)	43	MIN. % COMPA	CTION & G.	92.0
No. 8	(2.36 mm) 2	29	MIX TEMPERAT	TURE F.	315
No. 16	(1.18 mm) 2	23	NON-STRIP AL	DITIVE %	0.25
No. 30	(0.600 mm)	L <b>7</b>	MODIFIER %		0.00
No. 50	(0.300 mm)	9	Nini/Ndes/Nmax		8/106/169
No. 100	(0.150 mm)	7			
No. 200	(0.075 mm)	4.4			

ASPHALT CEMENT SUPPLIER: CITGO WILMINGTON

TACK COAT SUPPLIER : SEACO, COLUMBIA, SC CRS-1 NON-STRIP ADD. SUPPLIER: ARR-MAZ AD-HERE LOF 65-00 COMMENTS: "CORRECTED COPY" Correction on MAX SP. GR.

APPROVED BY:

J. E. GRADY, JR.

D-PAVEMENT CONSTRUCTION ENGR.

D-03-1

DATE JMF VOID:

P.O. BOX 37 GARNER, NC 27529 3709 03

Verification mD97-493

	n n gs
COUNTY: Lee CONTRACTOR: Lee Paving Company PLINT. Pea Ridge Road DESIGNED BY: Sam Johnson  SRECIFICATION: Superpave 12.5mm AC SPECIFIC GRAVITY: AC SPECIFIC GRAVITY: 1.030 MERTIN MARIETTA LAB NUMBER: 97A.411  MADDITIVE: Adhere 65-00, .259 Martin Marietta L. Springs #67n Martin Marietta L. Springs #78n Martin Marietta L. Springs Scm Martin Martin Marietta L. Springs Scm Martin Martin Marietta L. Springs Scm Martin Martin Marietta L.	n gs l ines mbined
CONTRACTOR: Lee Paving Company PLENT. Pea Ridge Road Martin Manetta L. Springs #78n DESIGNED BY: Sam Johnson Martin Marietta L. Springs #78n SMECIFICATION: Superpave 12.5mm Mix 166* C GERATIONS: 8/106/169 6 inch Comp. 153* AC SPECIFIC GRAVITY: 1.030 MERTIN MARIETTA LAB NUMBER: 97A.411  PARASSING L Springs L Springs 0 Natural Sanford Co	n gs l ines mbined
PLENT. Pea Ridge Road DESIGNED BY: Sam Johnson SECIFICATION: Superpave 12.5mm Mix 166* C GERATIONS: 8/106/169 6 inch Comp. 153* AC SPECIFIC GRAVITY: 1.030 MERTIN MARIETTA LAB NUMBER: 97A.411  PASSING L Springs L Springs 0 Natural Sanford Comp. 153*	n gs I ines mbined
DESIGNED BY: Sam Johnson  SATISTICIFICATION: Superpave 12.5mm Mix 166* C  GRATIONS: 8/106/169 6 inch Comp. 153* Rambeaut Natural Sans  AC SPECIFIC GRAVITY: 1.030 Lee Paving Sanford Bagf  MERTIN MARIETTA LAB NUMBER: 97A.411  9 PASSING L Springs L Springs D Natural Sanford Co	gs I ines mbined
SECIFICATION: Superpave 12.5mm Mix 166* C GRATIONS: 8/106/169 6 inch Comp. 153* Rambeaut Natural Sand AC SPECIFIC GRAVITY: 1.030 Lee Paving Sanford Bagf MERTIN MARIETTA LAB NUMBER: 97A.411  PASSING L Springs L Springs 0 Natural Sanford Co	ines mbined
RATIONS: 8/106/169 6 inch Comp. 153* Rambeaut Natural Sance SPECIFIC GRAVITY: 1.030 Lee Paving Sanford Bagf MERTIN MARIETTA LAB NUMBER: 97A.411  PASSING L Springs L Springs 0 Natural Sanford Comp. 153*	ines mbined
AC SPECIFIC GRAVITY: 1.030 Lee Paving Sanford Bagf MERTIN MARIETTA LAB NUMBER: 97A.411  PASSING L Springs L Springs 0 Natural Sanford Co	ines mbined
MERTIN MARIETTA LAB NUMBER: 97A.411  PASSING L Springs L Springs 0 Natural Sanford Co	mbined
9 PASSING L Springs L Springs 0 Natural Sanford Co	
! CIE\/E	adation
	100%
	100.0
1 1/2" 37.5 100.0 100.0 100.0 100.0 100.0	100.0
ın. 25.0 100.0 100.0 100.0 100.0 100.0	100.0
4 in. 19.0 100.0 100.0 100.0 100.0 100.0	100.0
1/2 in. 12.5 62.0 99.0 100.0 100.0 100.0	93.8
3/8 in 9.5 30.0 90.0 100.0 100.0 100.0	84.0
#4 4.75 5.2 23.0 99.0 99.9 100.0	43.2
#8 2.36 2.1 4.0 83.0 99.7 100.0	29.3
<b>#16</b> 1.18 1.5 3.0 57.0 94.0 100.0	23.1
<b>#30</b> 0.600 1.0 2.0 40.0 70.0 100.0	16.9
#50 0.300 1.0 1.0 27.0 22.0 100 0	9.0
<b>#1</b> 00 0.150 0.8 1.0 19.0 12.0 100.0	6.5
#200 0.075 0.6 0.5 13.0 6.6 95.0	4.4
Sp. Gr. Bulk Dry 2.654 2.631 2.639 2.574 2.700	2.631
1 ' · · · · · · · · · · · · · · · · · ·	2.688
ption, %(water) 0.70 0.90 0.60 0.97 1.0	
	2.668
Rice Effective 2.664 <u>Volumetric at N design</u>	
	Absorp.
	.55%
	nformation
	IN RAP
% Solids Total Mix 95.6% #DIV/0! 95.7% #DIV/0! #DIV/0!	0.0
	from RAP
% by Volume of AC 10.4% #DIV/0! 10.6% #DIV/0! #DIV/0!	0.0
	le Strength
% Solids of Agg. Only 85.3% #DIV/0! 85.1% #DIV/0! #DIV/0! 14.8% #DIV/0! 15.0% #DIV/0! #DIV/0!	o Shengur
	Asphalt
%Dust/AC 0.98% 1 07% 0.96% 0 86% 0.79%	
	Des )
	er
	,
	ids
Comments: SE=46 CAA=100/100 VFA	
IADDroved By / IPAA=4/ IDUST/	/c
D-03-2 Flat and Elong =0	i

#### 12

MLR-10 (3/97)

# MARTIN MARIETTA AGGREGATES MATERIALS LABORATORY

P.O. BOX 37 GARNER, NC 27529 370903. Dane 10 370965 M097-493

DAME SUBMIT	TED:	29-May-97			DATE APPR	OVED:	6-2-6	7
JECT NO.					ASPHALT:		Citgo PG70-	
COUNTY:	•	Lee			ADDITIVE:		Adhere 65-0	
CONTRACTOR	R. Lee	Paving Comp	anv		Martin Mariet	ta	L. Springs	#67m
PL∰VT:		Pea Ridge Road	•		Martin Mariet		L. Springs	#78m
DESIGNED BY		Sam Johnson	_		Martin Manet		L. Springs	Scmgs
SPECIFICATION		Superpave 12.	5mm	Mix 166*C				
SYNATIONS:	J14.	8/106/169	6 inch	Comp. 153*C	Rambeaut		Natural	Sand
AC SPECIFIC	GPAVITY		1.030	30mp. 133 G	Lee Paving		Sanford	Bagfines
S-SFECILIO 			97A.411		Lee Favilig		Gailloid	Dayinics
	ELIALA			1 (		Natural	Conford	Combined
% ASSING SIEVE	(mm)	∟ Springs #67m	L. Springs #78m	L. Springs Scrngs	0	Sand	Sanford Bagfines	Combined Gradation
21EAE	- (11111)	15%	55%	19%		10%	1%	<u> </u>
<u> 2"                                   </u>	50	100.0	100.0	100.0	<u> </u>	100.0	100.0	100%
1 1/2"	37.5	100.0	100.0	100.0		100.0	100.0	100.0
= = <del></del>				i		<del>+</del>	†	+
1 in.	25.0	100.0	100.0	100.0	<u> </u>	100.0	100.0	100.0
3/4 in.	19.0	100.0	100.0	100.0	1	100.0	100.0	100.0
1/2 in.	12.5	62.0	99.0	100.0		100.0	100.0	93.8
3/8 in.	9.5	30.0	90.0	100.0		100.0	100.0	84.0
= #4	4.75	5.2	23.0	99.0		99.9	100.0	43.2
#8	2.36	2.1	4.0	83.0		99.7	100.0	29.3
#16	1.18	1.5	3.0	57.0	T .	94.0	100.0	23.1
#30	0.600	1.0	2.0	40.0		70.0	100.0	16.9
#50	0.300	1.0	1.0	27.0	1	22.0	100.0	9.0
#100	0.150	0.8	1.0	19.0		12.0	100.0	6.5
#200	0.075	0.6	0.5	13.0		6.6	95.0	4.4
Sp. Gr. Bulk D	ry	2.654	2.631	2.639		2.574	2.700	2.631
Sragr. Appare	ent	2.705	2.694	2.680		2.640	2.700	2.688
Atterprotion, %(	water).	0.70	0.90	0 60		0.97	1 0	
ntial AC Conte	ent:	5 02%	(initial)		<del></del>	RICE EFFEC	TIVE.	2.667
		Rice Effective	2.664	Volu	metric at N d	esign		
% SPHALT			5.02%	4 67%	5.17%	5.67%	6.17%	% AC Absorp
Specific Gravit	ly		2.360	2.354	2.364	2.372	2.375	0.54%
May. Specific	Gravity		2.468	2.483	2.465	2.447	2 429	RAP Information
Jr Weight			147.3	146 9	147 5	148 0	148 2	% AC in RAP
Solids Total	Mix		95.6%	94 8%	95.9%	97 0%	97.8%	0.0
% ¥oids Total	Mix		4.4%	5.2%	4.1%	3.0%	2 2%	% AC from RAP
% Volume o			10.4%	9.4%	10.6%	11.8%	13 0%	0.0
% Solids of Ag			85.3%	85 3%	85.3%	85.1%	84 8%	Tensile Strengt
% <b>≝oids</b> of Age	<u> </u>		14 8%	14 7%	14.8%	14 9%	15 3%	
% oids Filled			70.4%	64 6%	72.3%	79 6%	85 5%	% Asphalt
%Dust/AC			0.98%	1 08%	0 96%	0 87%	0 79%	1
EFE AC CON	TENT		4.52%	4 13%	4 63%	5 13%	5 63%	%AC(Des ) 5.
	(%Gmm)	8	86.7%	85 8%	86 5%	87 2%	87 7%	Rice Gr
	(%Gmm)		95.6%	94 8%	95 9%	97 0%	97 8%	Lab Gr
	(%Gmm)		96.9%	96 0%	97 3%	98 3%	99 1%	Air Voids
aned By	V	///			Comments:			VMA
•	22:11	Lichon			SE=46	CAA=100/100	כ	VFA
Approved By	• ^		<u> </u>		FAA=47			DustAC 0.96
(	<u>.</u> , H.	المالا	Cred by.	6 - 5 BAJ31	Flat and Elon	g.=0		

D.03-3

P.O. BOX 37 GARNER, NC 27529 370903

Verification MD97-492

DATE SUBMIT	TED:	2-May-97			DATE APPR	OVED:	•	
PF JECT NO.					ASPHALT:		Citgo PG70-2	22
CUUNTY:		Lee		ADDITIVE:		Adhere 65-00		
CONTRACTOR	R: Lee	Paving Compa	anv		Martin Mariet	ta	L. Springs	#67
PL NT:		ea Ridge Road	•		Martin Mariet		L. Springs	#78
DESIGNED BY		Sam Johnson			Martin Mariet		L. Springs	Scrngs
SPECIFICATION		Superpave 19.	0mm	Mix 166* C			, 3	
GY ATIONS:		8/106/169	6 inch	Comp. 153*	Rambeaut		Natrual	Sand
AC SPECIFIC	GRAVITY		1.030		Lee Paving		Sanford	Bagfines
MARTIN MARI			97A.410		Lee I aving		Camord	Dayines
% ASSING	1	L Springs	L Springs	L. Springs	0	Natrual	Sanford	Combined
SIEVE	(mm)	#67	#78	Scrngs	0	Sand	Bagfines	Gradation
	\''''''	50%	22% -	17%	<del>                                     </del>	10%	1%	100%
2"	50	100.0	100.0	100.0		100.0	100.0	100.0
= <del>2</del> 1 1/2"	37.5	100.0	100.0	100.0		100.0	100.0	100.0
				100.0	<del>                                     </del>			<del>                                     </del>
1 in.	25.0	100.0	100.0			100.0	100.0	100.0
3/4 in.	19.0	98.0	100.0	100.0		100.0	100.0	99.0
1/2 in.	12.5	61.0	99.0	100.0	ļ	100.0	100.0	80.3
_3/8 in.	9.5	29.0	90.0	100.0		100.0	100.0	62.3
#4	4 75	5.0	23.0	99.0		99.9	100.0	35.4
#8	2.36	2.0	4.0	83.0		99.7	100.0	27.0
#16	1.18	1.5	3.0	57.0	ļ	94.0	100.0	21.5
#30	0.600	1.0	2.0	40.0		70.0	100.0	15.7
#50	0.300	1.0	1.0	27.0		22.0	100.0	8.5
#100	0.150	0.8	1.0	19.0		12.0	100.0	6.1
200	0 075	0.6	0.5	13.0		6.6	95.0	4.2
عب. عr. Bulk D	ry	2.654	2.631	2.639		2.574	2.700	2.639
Sp. Gr Appare	ent	2.705	2.694	2.680		2.640	2.700	2.692
Attorption, %(	(water):	0.70	0.90	0.60		0.97	10	Ī
Intial AC Conte	ent	4.48%	(initial)			RICE EFFEC	TIVE.	2.667
		Rice Effective	2.665	Volu	ımetric at N d	esign		
% SPHALT			4 48%	4 20%	4.70%	5.20%	5.70%	% AC Absorp.
Specific Gravit	tv		2.381	#DIV/0!	2.391	#DIV/0!	#DIV/0!	0.42%
Max Specific	Gravity		2.488	2.500	2.482	2.463	2.446	RAP Information
/eight	<del></del>		148.5	#DIV/01	149 2	#DIV/0!	#DIV/0!	% AC IN RAP
/ Julids Total	Mix		95.7%	#DIV/0!	96 3%	#DIV/0!	#DIV/01	0.0
% Voids Total			4.3%	#DIV/01	3.7%	#DIV/01	#DIV/01	% AC from RAP
% Volume			9.5%	#DIV/0!	9.9%	#DIV/0!	#DIV/0!	0.0
% solids of Ag			86.2%	#DIV/01	86 4%	#DIV/01	#DIV/01	Tensile Strength
% Voids of Ag			13.8%	#DIV/0!	13.7%	#DIV/01	#DIV/0!	rensite Strength
as Filled	<u> </u>		68.7%	#DIV/01	73.1%	#DIV/01	#DIV/0!	% Asphalt
/JULIUT/AC	411/13DII		1.03%	1 12%	0.99%	0 88%	0.80%	- AJDITUIL
EFF AC CON	TENT		4.09%	3.78%	4 28%	4 78%	5 28%	%AC(Des )
N tial	(%Gmm)	8	86.7%	#DIV/01	86 9%	#DIV/01	#DIV/01	Rice Gr
Nesian	(%Gmm)		95.7%	#DIV/01	96 3%	#DIV/01	#DIV/01	Lab Gr
	(%Gmm)	169 /	97.0%	#DIV/01	97 7%	#DIV/01	#DIV/01	Air Voids
Daigned By:	/				Comments:			VMA
J	Sam	16 Kmc			SE=50	CAA=100/100	)	VFA
Approved By	· <del>-</del>	1			FAA=47			Dust/AC
i '		-		D-03-	Flat and Eon	g =0		1

## MAKTIN WAKIETTA AGGREGATES

## **MATERIALS LABORATORY**

P.O. BOX 37

370903

**GARNER, NC 27529** 

							m 097-	492
DATE SUSMI	ITTED	29-May-97			DATE APPRO	OVED:	6-2	-97
PEDJECT NO	o 6	. 54-400	, T		ASPHALT:		Citgo PG70-	
C 1TY		Lee	•		ADDITIVE.		Adhere 65-0	
CONTRACTO	OR [.] Lee	Paving Compa	any		Martin Manet	ta	L. Springs	#67
₽Ĺ <b>≜</b> NT		ea Ridge Road	t		Martin Mariet	ta	L. Sonngs	<i>#</i> 78
DE IGNED E	Y	Sam Johnson			Martin Manet	ta	L. Springs	Scrngs
SPECIFICAT	ION:	Superpave 19.	0mm	Mix 165*C				
GWATIONS		8/106/169	6 inch	Comp. 153*C	Rambeaut		Natrual	Sand
A PECIFIC	GRAVITY	:	1.030		Lee Paving		Sanford	Bagfines
MARTIN MAR			97A.410				-	<b>_</b> _
SSING		L. Springs	L. Springs	L Springs	i o	Natrual	Sanford	Combined
E'/E	(mm)	#67	#78	Scrngs	0	Sand	Bagfines	Gradation
		50%	22%	17%	Î	10%	1%	100%
2"	50	100.0	100.0	100.0	Ì	100.0	100.0	100.0
1 1 2"	37.5	100.0	100.0	100.0	İ	100.0	100.0	100.0
1 ::	25.0	100.0	100.0	100.0		100.0	100.0	100.0
3,4 .n	19.0	98.0	100.0	100.0	1	100.0	100.0	99.0
—1 ⊋ n.	12.5	61.0	99.0	100.0		100.0	100.0	80.3
3,8 n	9.5	29.0	90.0	100.0		100.0	100.0	62.3
#4	4 75	5.0	23.0	99 0		99.9	100.0	35.4
#3	2.36	2.0	4 0	83.0		99.7	100.0	27.0
	118	1.5	3.0	57 0		94.0	100.0	21.5
#30	0.600	1.0	2.0	40.0		70.0	100.0	15.7
#50	0 300	1 0	1 0	27 0		22.0	100.0	8.5
#100	0 150	0.8	1 0	190	1	12.0	100 0	6.1
#200	0 075	0.6	0.5	13.0		6.6	95 0	4 2
Sp. G. Eulk !	Dry	2.654	2.631	2.639	·	2.574	2.700	2.639
SpeGr -opar	•	2.705	2.694	2.680		2.640	2.700	2.692
Abborrian, %		0 70	0 90	0 60		0 97	1 0	İ
Intial AC Con		4 48%	(initial)			RICE EFFEC		2.669
		Rice Effective	2.665	Volu	metric at N de			
% SF-ALT			4 48%	4.10%	4.60%	5.10%	5 60%	% AC Absorp.
Specific Grav	/ity		2.381	2.355	2.380	2.394	2.397	0.45%
M. C. Citic	•		2.488	2.506	2.487	2.469	2.451	RAP Information
Ur (,nt	· · · · · · · · · · · · · · · · · · ·		148.5	146.9	148 5	149 4	149 6	% AC in RAP
% Solics Tota	al Mix		95.7%	94 0%	95.7%	97 0%	97 8%	0.0
% pics ota	t Mix		4.3%	6 0%	4 3%	3 0%	2 2%	% AC from RAP
% Ty _ ime	of AC		9 5%	8 3%	9 6%	10 8%	12 0%	0.0
% Solice of A			86.2%	85 6%	86 1%	86 2%	85.8%	Tensile Strenath
יטופי יא Ac	, ,		13.8%	14 4%	13.9%	13.9%	14 2%	
್ಯ Voids Filled			68.7%	58 2%	69 1%	78 1%	84 6%	% Asphalt
% <u>Dust</u> ~?			1.03%	1 16%	1 02%	0.91%	0 82%	]
EF AC CON	VTENT		4.09%	3 65%	4 15%	4 65%	5 15%	%AC(Des )4.7
Nimbal	(%Gmm)	8	86.7%	85 5%	86 8%	87 4%	87 9%	Rice Gr
	(%Gmm)	106	95.7%	94 0%	95.7%	97 0%	97 8%	Lab Gr
4 ι uxι ∙w	(%Gmm)	169	- 97.0%	95 2%	97 0%	98 3%	99 2%	Air Voias
Designet ∃y	$\overline{V}$	111		-	Comments:			VMA
. =	V:11	1/ Kin		D-03-5	SE=50	CAA=100/10	כ	VFA
Aplova By	C D.	(X 0: 200	ra O Ir	12.2.97	FAA=47 Flat and Fond	=0		Dust AC 0.98

P.O. BOX 37 GARNER, NC 27529 370003

			GA	RNER, NC 27	7529	ver:fic	المدنكد	M O 97-49
PATE SUBMIT	TED:	2-May-97	· · · · · · · · · · · · · · · · · · ·		DATE APPRO		- B   10 /V	140 1757
JECT NO	.:				ASPHALT:	<del></del>	Citgo PG70-	22
COUNTY:		Lee			ADDITIVE:		Adhere LOF	
ONTRACTO	R: Lee	Paving Comp	anv		Martin Mariet	la	L. Springs	#4
P ANT:		Pea Ridge Road	•		Martin Manet		L. Springs	#5
DESIGNED BY		Sam Johnson	_		Martin Mariet		L. Springs	#67
SECIFICATION		Superpave 37.	5mm	Mix 166* C	Martin Mariet			
'ATIONS:	J14.	8/106/169	6 inch		Martin Mariet		L. Springs	#78m
	CDAVITA			Comp. 133 C	i	ıa	L. Springs	Reg.Scmgs
AC SPECIFIC			1.030		Lee Paving		Sanford	Bagfines
	E I IA LA	B NUMBER:	97A.409			<del></del>		
ASSING		L. Springs	L. Springs	L Springs	L. Springs	L. Springs	Sanford	Combined
SIEVE	(mm)	#4	#5	#67	#78m	Reg.Scrngs	Bagfines	Gradation
		20%	31%	15%	11%	22%	1%	100%
2"	50	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1 1/2"	37.5	99.0	100.0	100.0	100.0	100.0	100.0	99.8
1 in.	25.0	50.0	96.0	100.0	100.0	100.0	100.0	88.8
3/4 in.	19.0	14.0	52.0	98.0	100.0	100.0	100.0	67.6
1/2 in.	12.5	5.0	5.0	61.0	99.0	100.0	100.0	45.6
3/8 in.	9.5	2.0	3.0	29.0	90.0	100.0	100.0	38.6
#4	4.75	1.0	2.0	5.0	23.0	99.0	100.0	26.9
#8	2.36	1.0	1.0	2.0	4.0	83.0	100.0	20.5
#16	1.18	1.0	1.0	1.5	3.0	57.0	100.0	14.6
#30	0.600	1.0	1.0	1.0	2.0	40.0	100.0	10.7
#50	0.300	1.0	1.0	1.0	1.0	27.0	100.0	· 7.7
#100	0.150	8.0	0.6	8.0	1.0	19.0	100.0	5.8
#200	0.075	0.4	0.4	0.6	0.5	13.0	95.0	· , \4.2
Sp. Gr. Bulk D	ry	2.670	2.668	2.654	2.631	2.639	2.700	2.656
Sr. Appare	ent	2.715	2.710	2.705	2.694	2.680	2.700	2.702
Asorption, %(	water):	0.50	0.60	0.70	0 90	0.60	1 00	·
Intial AC Conte	ent:	3.53%	(initial)			RICE EFFECT	IVE.	2.672
		Rice Effective	2.657	Volu	metric at N de	sign		
SPHALT			3.53%	4 00%	4.50%	5.00%	5.50%	% AC Absorp.
Specific Gravit	y		2.393	#DIV/01	2.407	#DIV/01	#DIV/0!	0.23%
Max. Specific	Gravity		2.517	2.512	2.493	2.474	2.456	RAP Information
it Weight			149.3	#DIV/0!	150.2	#DIV/0!	#DIV/0!	% AC in RAP
% Solids Total			95.1%	#DIV/0!	96.6%	#DIV/01	#DIV/0!	0.0
Voids Total	Mix		4.9%	#DIV/0!	3.4%	#DIV/0!	#DIV/0!	% AC from RAP
by Volume of	of AC		8.2%	#DIV/0!	10.0%	#DIV/0!	#DIV/0!	0.0
% Solids of Ag	g. Only		86.9%	#DIV/01	86 6%	#DIV/01	#DIV/0!	Tensile Strength
Voids of Age	g. Only		13.1%	#DIV/01	13 4%	#DIV/01	#DIV/0!	
Voids Filled	w/Asph		62.4%	#DIV/0¹	74 5%	#DIV/01	#DIV/01	% Asphalt
%Dust/AC		_	1.18%	1.10%	0 97%	0.87%	0 79%	
EFF AC CON			3.51%	3 77%	4 27%	4 77%	5 27%	%AC(Des )
	(%Gmm)	8	85.5%	#DIV/01	86 3%	#DIV/01	#DIV/0!	Rice Gr
	(%Gmm)	106	95.1%	#DIV/01	96 6%	#DIV/01	#DIV/01	Lab Gr
	(%Gmm)	169	96.6%	#DIV/01	98 2%	#DIV/01	#DIV/0!	Air Voids
ligned By.	. X.	1 Ch	٥		Comments:			VMA
LAnnes S	1/2/11	the the	24		6	CAA=100/100		VFA
IApproved By:				D-03-6	SE=60	@£.4=2		Dust/AC
				D-03-	Flat and Elong	(@5-1=0		

P.O. BOX 37

370903

**GARNER, NC 27529** 

MD97-491

							71077-	, , ,
SUBMIT	TED:	29-May-97			DATE APPRO	OVED:	6-2	-97
ECT NO	.: 6	. 54900	77		ASPHALT:		Citgo PG70-2	22
COUNTY:		Lee	• •		ADDITIVE:		Adhere LOF	
RACTO	R: Lee	Paving Compa	any		Martin Manet	la	L. Springs	#4
Τ:	F	Pea Ridge Road	1		Martin Mariett	ta	L. Springs	#5
DESIGNED BY	Y:	Sam Johnson			Martin Mariett	ta	L. Springs	#67
SECIFICATION	ON:	Superpave 37.	5mm	Mix 166*C	Martin Mariett	ta	L. Springs	#78m
GRATIONS:		8/106/169	6 inch	Comp. 153*C	Martin Mariett	ta	L. Springs	Reg.Scrngs
AC SPECIFIC	GRAVITY	<b>':</b>	1.030		Lee Paving		Sanford	Bagfines
MERTIN MAR			97A.409		ľ			g
% PASSING		L. Springs	L. Springs	L. Springs	L. Springs	L. Springs	Sanford	Combined
SIEVE	(mm)	#4	#5	#67	#78m	Reg.Scrngs	Bagfines	Gradation
	<b>(</b> 12.11.1, <b>)</b>	20%	31%	15%	11%	22%	1%	100%
2"	50	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1 1/2"	37.5	99.0	100.0	100.0	100.0	100.0	100.0	99.8
1 in.	25.0	50.0	96.0	100.0	100.0	100.0	100.0	88.8
3/4 in.	19.0	14.0	52.0	98.0	100.0	100.0	100.0	67.6
1/2 in.	12.5	5.0	5.0	61.0	99.0	100.0	100.0	45.6
3/8 in.	9.5	2.0	3.0	29.0	90.0	100.0	100.0	38.6
#4	4.75	1.0	2.0	5.0	23.0	99.0	100.0	26.9
#8	2.36	1.0	1.0	2.0	4.0	83.0	100.0	20.5
#16	1.18	1.0	1.0	1.5	3.0	57.0	100.0	14.6
#30	0.600	1.0	1.0	1.0	2.0	40.0	100.0	10.7
#50	0.300	1.0	1.0	1.0	1.0	27.0	100.0	7.7
1100	0.150	0.8	0.6	0.8	1.0	19.0	100.0	5.8
200	0.075	0.4	0.4	0.6	0.5	13.0	95.0	4.2
Sp. Gr. Bulk D		2.670	2.668	2.654	2.631	2.639	2.700	2.656
ir. Appare	•	2.715	2.710	2.705	2.694	2.680	2.700	2.702
ption, %		0.50	0 60	0.70	0.90	0.60		2.702
Intial AC Conti		3.53%		0 70	0.90	RICE EFFEC	1 00	]
initial AC Conti	ent:		(initial)	Volu	emotrio at N d		IIVE.	2.665
% ASPHALT		Rice Effective	2.657	3.40%	metric at N de		4.000/	10/ AC Absor
	4		3.53% 2.393	2.355	3.90% 2.376	4.40%	4.90%	% AC Absorp.
Specific Gravi					<u> </u>	2.383	2.390	0.13%
Specific	Gravity		2.517	2.529	2.510	2.491	2.473	RAP Information
Neight % Solids Total	I May		149.3 95.1%	93.1%	148.2 94.7%	148.7 95.7%	149 1 96 6%	% AC in RAP 0.0
% Solids Total			4.9%	6.9%	5.3%			4
				<del>                                     </del>	<del>†</del>	4 3%	3 4%	% AC from RAP
/ Volume			8.2%	7 5%	8.7%	9 9%	11 1%	0.0
% Solids of Ac	<del>/ / / / / / / / / / / / / / / / / / / </del>		86.9%	85 7%	86.0%	85 8%	85 6%	Tensile Strength
ids of Ag	· · · · · · · · · · · · · · · · · · ·		13 1%	14 3%	14 0%	14 2%	14 4%	0/ 0
ids Filled	WASPN		62.4%	52.2%	62 0%	69 6%	76 7%	% Asphalt
%Dust/AC	ITENIT		1.18%	1 27% 3 27%	1 10%	0 97%	0 87%	%AC(Des ) 4.5
E F AC CON		8	3.51% 85.5%	83 4%	84 7%	4 27%	4 77%	-
N ntial N design	(%Gmm) (%Gmm)	106	95.1%	93 1%	94 7%	85 0% 95 7%	85 8% 96 6%	Rice Gr Lab Gr
		169	96.6%	94 6%	96 3%	97 3%	98 4%	Air Voids
signed By.	V V	/ / /.	55.570	34370	Comments:	3. 378	30 770	VMA
January.	A.	Leka:			FAA=50	CAA=100/100		VFA
Approved By		<u> </u>			SE=60	3,5 (= 100/100		DUSTAC 0.96
(	$\mathcal{A}$ . $\mathcal{A}$ .	( Dia	and In	6-2D97	Flat and Elone	g @5 1=0		
L `			->		3-7	<del>, , , , , , , , , , , , , , , , , , , </del>		<u>.L</u>

#### **South Bound**

**Supplemental Test Section 370960** 

Superpave Mix with Multigrade PG 76-22

Surface Course - 12.5 mm

### NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH, NORTH CAROLINA 27611

#### SUPERPAVE HOT MIX ASPHALT JOB MIX FORMULA

LEE PAVING COMPANY TYPE MIX: ACSC, TYPE SP 12.5

SANFORD, NC JOB MIX FORM. NO: 98-481-071

> EFFECTIVE DATE: 9/9/98

PLANT CERTIFICATION NO: B-033 PROJECT NO:

> COUNTY: LEE

#### AGGREGATE SOURCES AND BLEND PERCENTAGES

SUPPLIER	LOCATION/SOURCE	MATERIAL	BLEND (%)
MARTIN MARIETTA	L. SPRINGS QUARRY	#67	15.0
MARTIN MARIETTA	L. SPRINGS QUARRY	78M	55.0
MARTIN MARIETTA	L. SPRINGS QUARRY	SCRGS,	20.0
LEE PAVING CO.	RAMBEAUT PIT	N.SAND	10.0

		TOTAL %	100.0
JMF COMBINED	GRADATION	ASPHALT BINDER %	5.8
SIEVE SIZE	%PASSING		
50.0 mm	100	BINDER GRADE	PG 76-22
37.5 mm	100	Gmm meas. (Rice)	2.447
25.0 mm	100	Gmb @ Ndes (Corrected)	2.349
19 0 mm	100	VTM @ Ndes (Corrected)	5.0
12 5 mm	94	VMA @ Ndes (Corrected)	16.0
9.5 mm	84	VFA @ Ndes (Corrected)	0. <b>0</b>
4 75 mm	43	Mix Temperature	3 <b>00</b>
2.36 mm	28	Min Compaction (% of Gmm)	92.0
1 18 mm	22	Non-Strip Additive %	0.75
0.600 mm	14	Modifier %	0.0
0 300 mm	8	Nini/Ndes/Nmax	8/106/169
0 150 mm	6	PG 76-22 (ADDIT'L)	0.0
0.075 mm	4 1	% BINDER FROM RAP	0.0
		TOTAL % BINDER IN MIX	5.8

ASPHALT CEMENT SUPPLIER. SUIT KOTE, MULTIGRADE

TACK COAT SUPUPLIER. SPECS. NON-STRIP ADD. SUPPLIER: HP PLUS

COMMENTS:

CORRECTED COPY CORRECTION MADE ON THE BINDER GRADE

DATE JMF VOID.

APPROVED BY: DJ6E-IGRADY, JR., PE
D-60-1 PAVEMENT CONSTRUCTION ENGINEER 15-Apr-98

Lee

Les Paving Company

Sanford

Sam Johnson

8/106/169

L. Springs #67 °

15%

100.0

100.0

100.0

100.0

62.0

30.0

5.2

1.5

1.5

1.0

1.0

0.8

0.6

2.654

2.705

0.70

5.05%

Rice Effective:

Superpave 12.5mm

1.037

98A.286

L. Springs

#78m

55%

100.0

100.0

100.0

100.0

99.0

90.0

23.0

2.0

1.5

1.5

1.0

1.0

0.5

2.631

2.694

0.90

ATE SUBMITTED:

ROJECT NO.:

IOF RACTOR

JESINED BY.

SYNATIONS:

% PASSING

SIEVE

1 1/2"

1 ln.

/4 in.

1/2 in.

3/8 in.

#4

#8

#16

130

750

#100 #200

Sp. Er. Bulk Dry r. Apparent مَوْدَ

nti AC Content:

6 ASPHALT

Jnit Weight

6Dust/AC

ic ni v

Specific Gravity

15serption, %(water):

Max Specific Gravity

% Solids Total Mix % Valds Total Mix

% PVolume of AC

% Solids of Agg. Only

to lids of Agg. Only ids Filled w/Asph

(%Gmm)

(%Gmm)

FF AC CONTENT

FICATION:

ACEPECIFIC GRAVITY:

HIN MARIETTA LAB NUMBER:

(mm)

50

37.5

25.0

19.0

12.5

9.5

4.75

2.36

1.18

0.600

0.300

0.150

0.075

**T**iTY

SLANT:

### MARTIN MARIETTA AGGREGATES MATERIALS LABORATORY

370960

P.O. BOX 37 GARNER, NC 27529

MD 98-481 DATE APPROVED: 3-25-98 ASPHALT: Suit Kote PG76-22, Mutuarade HP PLUS .75% Adhere 05 80; 28% ADDITIVE: Martin Marietta L. Springs #67 · L. Springs Martin Marietta #78m. L. Springs Screenings Martin Marietta Rambeaut Natural Sand Mix 325*F Lee Paving Sanford Bagfines Comp 300*F Senford L. Springs Natural Combined Sand Bagfines 0 Screenings Gradation 10% 1% 100% 19% 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 93.8 100.0 100.0 100.0 84 0 99.0 100.0 100.0 43.2 100.0 83.0 99.9 28.1 57.0 100.0 87.5 21.6 40.0 100.0 42.0 13.8 27.0 13.9 100.0 8.2 100.0 19.0 6.1 5.9 13.0 2.7 95.0 4 1 2.639 2.574 2,700 2 631 2.680 2.640 2.700 2.686 1.00 0.60 0.97 RICE EFFECTIVE: 2 671 Volumetric at N design 4.70% 5.20% 5.70% 6.20% % AC Absorp. 2.295 2.322 2.348 2.337 C.59% 2.487 2.469 2.451 2.433 RAP Intermution 144.9 146.5 145 9 143.2 % AC IT RAP: 94.0% 95.8% 96.1% 92.3% 0.0 6.0% 4.2% 3.9% % AC Irom BAP 7.7% 9.1% 10.3% 11.6% 12.5% 00 83.2% 83.7% 84 2% 83 4% Tensse Strength 102.4% 16.9% 16.3% 15.8% 16.7% <del>60.9%</del> 54.3% 63.6% 73.6% 78 4% % Aschalt 0.88% 0.79% 0.72% 5.8% 0.99% 4.11% 4 81% 5.11% 5.61% %AC(Des.) 83.4% 84.9% 86.0% 86.4% Rice Gr-_

v de ign √ maximum (%Gphm) 169 93.4% Designed By wildy. em proved By:

106

92.3%

94 0%

95.3%

Comments:

95.8%

97.1%

96.1%

97.4%

Lab Gr

VMA.

VFA

Air Voids

Dust/AC 0.78

MLR-10 (3/97)

## **South Bound**

**Supplemental Test Section 370961** 

Superpave Mix with PG 64-22

Surface Course – 12.5 mm

#### NORTH CAROLINA DEPARTMETN OF TRANSPRTIATON RALEIGH, NORTH CAROLINA 27611

#### SUPERPAVE HOT MIX ASPHALT JOB MIX FORMULA

LEE PAVING COMPANY

TYPE MIX: ACBC, TYPE SP 12.5

SANFORD, NC JOB MIX FORM NO.: 97-442-021

EFFECTIVE DATE: 05-09-97

PLANT CERTIFICATION NO.: B-033 PROJECT NO.: 6.549001T

COUNTY: LEE-CHATHAM

#### AGGREGATE SOURCES AND BLEND PERCENTAGES

SUPPLIER	LOCATION/SOURCE	MATERIAL		BLEND
	***************************************			
MARTIN MARIETTA	LEMON SPRINGS QUARRY	#67		15.0
MARTIN MARIETTA	LEMON SPRINGS QUARRY	#78M		55.0
MARTIN MARIETTA	LEMON SPRINGS QUARRY	REG. SCRGS.		20.0
LEE PAVING CO.	RAMBEAUT PIT	N. SAND		10.0
			TOTAL	100.0%

JMF CO	•	GRADATION % PASSING	ASPHALT CEMENT %(TOT)	5.2
		******	GRADE	PG 64-22
			EST ASH	
2 "	50.0 mm		MAX. SP. GV.	2.464
1 1'2"	37.5		GYRATORY SP. GV: @Ne	2356 2.365
<u> 1</u> "	25.0		VOIDS IN TOTAL MIX%	4 0
3/4"	19.0	100	MIN. % COMPACTION% Gmm	92.0
1/2"	12.5	94	MIX TEMPERATURE F	300
3/8"	9 5	84	NON STRIP ADDITIVE %	0.25
No 4	4 75	43	MODIFIER %	0 00
8	2.36	29	GYRATIONS: N(INITIAL)	8
16	1.18	23	N(DESIGN)	106
30	0 600	17	N(MAX )	169
50	0 300	9	<b>VOIDS IN MIN AGG.%</b>	14 8
No. 10	0 150	7	VOIDS FILLED W/ASPH.%	73
No. 20	0 075	4 4		

ASPHALT CEMENT SUPPLIER CITGO WILMINGTON

TACK COAT SUPPLIER SPECS.

NON-STRIP ADD. SUPPLIER ARR-MAZ AD-HERE L0S6500

MODIFIER SUPPLIER

COMMENTS.

APPROVED BY.
J. E. GRADY, JR.

DATE JMF VOID.

PAVEMENT CONSTRUCTION ENGR.

## FROM MARTIN MARIETTA MAT'L LAB TO

## MATERIALS LABORATORY 370961

MARTIN MARIETTA AGGREGATES

P.O. BOX 37

GARNER, NC 27529

MD 97-442

DA E SUBMIT	T=D.	14-Арг-97			IDATE APPRO	OVED:	5-9-	971
PROJECT NO					ASPHALT:		Citgo PG64-2	
	0	.549001	1		ADDITIVE:		Adhere 65-00	
SCHNTY:	D: Loc	Lee Paving Comp	1961/		Martin Mariett	2	L. Springs	#67rh
PLANT:		Pea Ridge Roa	•		Martin Mariett		L. Springs	#78m
DESIGNED BY		Sam Johnson			Martin Mariett		L. Springs	Scrings
							pgc	
SPICIFICATION	ON:	Superpave 12		20215	Sambasut		Natural	Sand
SYRATIONS:		8/106/169	6 inch	292°F	Rambeaut			
AC_SPECIFIC			1.030		Lee Paving		Sanford	Bagfines
TIN MAR	IETTA LA		97A.335			F	1 0fd	
% PASSING		L Springs	L Springs	L Springs	0	Natural	Sanford	Combined
SIEVE	(mm)	#67m	#78m	Scrngs	0	Sand	Bagfines	Gradation
		15%	55%	19%		10%	100.0	100%
2"	50	100.0	100.0	100.0		<u> </u>		
1 1/2"	37.5	100.0	100.0	100.0		100.0	100.0	100.0
1 in.	25.0	100.0	100.0	100.0		100.0	100.0	100.0
3/4 in.	19.0	100.0	100.0	100.0		100.0	100.0	100.0
_1/2 in.	12.5	62.0	99.0	100.0		100.0	100.0	93.8
/8 in.	9.5	30.0	90.0	100.0		100.0	100.0	84.0
<b>- #4</b>	4.75	5.2	23.0	99.0		99.9	100.0	43.2
#8	2.36	2.1	4.0	83.0		99.7	100.0	29.3
#16	1.18	1.5	3.0	57.0		94.0	100.0	23.1
#30	0.600	1.0	2.0	40.0		70.0	100 0	16.9
#50	0.300	1.0	1.0	27 0		22.0	100.0	9.0
±100	0.150	0.8	1.0	19.0		12.0	100 0	6.5
:200	0.075	0.6	0.5	13.0		6.6	95 0	4.4
Sp. Gr. Bulk D	ry	2.654	2.631	2.639		2.574	2.700	2.631
Sper. Appare	ent	2.705	2.694	2.680		2.640	2.700	2.688
barption, %		0.70	0.90	0 60		0 97	1.0	
THE AC CONT		5.02%	(Initial)			RICE EFFEC	TIVE.	2.667
		Rice Effective	2.684	Volu	ımetric at N de	esian		
% PHALT			5.02%	4.67%	5.17%	5.67%	6.17%	% AC Absorp.
Specific Gravi	tv		2,360	2.354	2.364	2.372	2.375	0.54%
√a Specific			2.468	2.483	2.465	2.447	2.429	RAP Information
Jn Weight			147/3	146 9	147.5	148 0	148.2	% AC IN RAP
% Solids Total	Mix		95:6%	94.8%	95.9%	97.0%	97.8%	0.0
% Words Total	Mix		4.4%	5 2%	4 1%	3.0%	2.2%	% AC from RAP
%   Volume			=10.4%==	9.4%	10.6%	11.8%	13.0%	0.0
% Solids of Ac			85.3%	85.3%	85.3%	85 1%	84.8%	Tensile Strength
% ' ids of Aq			14.8%	14.7%	14.8%	14 9%	15 3%	1
% ids Filled	<u> </u>		-1-70.4%c	64 6%	72.3%	79.6%	85 5%	% Asphalt
%Dust/AC			0.98%	1 08%	0.96%	0.87%	0.79%	
FE AC CON	TENT		4:52%	4 13%	4 63%	5.13%	5 63%	%AC(Des ):5./
v is al	(%Gmm)	8		85.8%	86 5%	87.2%	87.7%	Rice Gr:
v design	(%Gmm)	106	95:6%	94.8%	95.9%	97.0%	97.8%	Lab Gr:
4 waxiwnw	(%Gm/n)	169	1411-96:996:ssz	96 0%	97.3%	98.3%	99.1%	Air Voids
emned By:	V	//_//		<del></del>	Comments:		_	VMA:
	Dan	- John	<u> </u>		SE=46	CAA=100/10	ס	VFA:
inproved By:	<b>7</b> ^ (	$\neg \langle \cap \cdot \rangle$	- 01	∠ O nCEX	FAA=47	0		Dust/AC:0.96
_ (	<u> </u>	·VRR	are Chi	- 217791	Flat and Elong	g.=u		1 2 40 5 5 5
		00	/	D-61.	. 2			MLR-10 (3/97)

## **South Bound**

**Supplemental Test Section 370962** 

Superpave Mix with SBR Modified PG 76-22

Surface Course - 12.5 mm

## NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH, NORTH CAROLINA 27611

#### SUPERPAVE HOT MIX ASPHALT JOB MIX FORMULA

Lee Paving Company

TYPE MIX: ACSC, TYPE SP 12.5

Sanford, NC JOB MIX FORM. NO: 98-468021

EFFECTIVE DATE: 8/4/98

PLANT CERTIFICATION NO: B-033 PROJECT NO: N/A

COUNTY: Lee

#### AGGREGATE SOURCES AND BLEND PERCENTAGES

SUPPLIER	LOCATION/SOURCE	MATERIAL	<b>BLEND (%)</b>
ı√lartın Marıetta	L. Springs Quarry	#67	15.0
Martin Marietta	L. Springs Quarry	#78M	55.0
Vartın Marıetta	L. Springs Quarry	Scrgs.	20.0
_ee Paving Co.	Rambeaut Pit	N.Sand	10.0

		TOTAL %	100.0
IMF COMBINED	GRADATION	ASPHALT BINDER %	5.8
SIEVE SIZE	<u>%PASSING</u>		
50.0 mm	100	BINDER GRADE	PG76-22
37.5 mm	100	Gmm meas. (Rice)	2.436
25.0 mm	100	Gmb @ Ndes (Corrected)	2.388
19.0 mm	100	VTM @ Ndes (Corrected)	4.0
12.5 mm	94	VMA @ Ndes (Corrected)	16.3
) 5 mm	84	VFA @ Ndes (Corrected)	75.0
4 75 mm	43	Mix Temperature	300
2.36 mm	28	Min Compaction (% of Gmm)	92.0
1.18 mm	22	Non-Strip Additive %	0.25
).600 mm	14	Modifier %	0.0
0.300 mm	8	Nini/Ndes/Nmax	8/106/169
).150 mm	6	PG76-22 (ADDIT'L)	5.8
) 075 mm	4.1	% BINDER FROM RAP	0.0
		TOTAL % BINDER IN MIX	5.8

ASPHALT CEMENT SUPPLIER. Citgo (See Comments)

TACK COAT SUPUPLIER: Specs.

NON-STRIP ADD. SUPPLIER: ARR-MAZ Adhere 65-00

COMMENTS PG76-22 made from CitgoPG64-22 w/3% Rub-R-Road Co-Polymer

DATE JMF VOID:

APPROVED BY:
J. E. GRADY, JR., PE
PAVEMENT CONSTRUCTION ENGINEER
D-62-1

INTY

SIEVE

2"

1 1/2"

1 in.

3/4 in

1/2 in

3/8 in

#4

#8

#16

#30

#50

#100

#200

IPLANT

370962

P.O. BOX 37 MD98-468 GARNER, NC 27529 7-31-98 ATE SUBMITTED 17-Apr-98 DATE APPROVED. PROJECT NO . ASPHALT. See Comments Lee ADDITIVE: Adhere 65-00, .25% ITRACTOR. Lee Paving Company Martin Marietta L. Springs #67 · L. Springs Sanford Martin Marietta #78m DESIGNED BY Sam Johnson Martin Marietta L. Springs Screenir ** CIFICATION Superpave 12.5mm Rambeaut Natural Sand LATIONS. 8/106/169 Sanford Mix 325 °F Lee Paving Bagfines AC SPECIFIC GRAVITY: 1.039 Comp 300°F RTIN MARIETTA LAB NUMBER: 98A.285 PASSING L. Springs L. Springs Natural Sanford 0 Comment L. Springs (mm) #67 * #78m Sand **Bagfines** ō Gradation Screenings 15% 55% 10% 1% 100% 19% 50 100.0 100.0 100.0 100.0 100.0 1000 1000 37.5 100.0 100.0 100.0 100.0 100.0 25.0 100.0 100.0 100.0 100.0 100.0 1000 100.0 19.0 100.0 100.0 100.0 100.0 1000 12.5 99.0 100.0 100.0 100.0 93 K 62.0 100.0 100.0 9 5 30.0 90.0 100.0 84 0 100.0 4 75 5.2 23.0 99 0 100.0 43 2 2.36 1.5 2.0 83 0 99 9 100.0 <u>2ε</u> · 1.18 1.5 1.5 57.0 87.5 100.0 21 6 0 600 1.0 1 5 40 O 42.0 100.0 13 2 0.300 13.9 100.0 8.2 1.0 1.0 27.0 1.0 100.0 5.9 0.150 0.8 19.0 6.1 0 075 0.6 0.5 13.0 2.7 95.0 4.1 2.574 2.631 . Gr. Bulk Dry 2.654 2.631 2.639 2.700 2,700 2.629 Gr. Apparent 2.705 2.694 2.680 2.640 Absorption, %(water) 0.70 0.90 0.60 0.97 1.00 RICE EFFECTIVE: al AC Content 2.656 5.05% TATE OF Volumetric at N design Rice Effective: W ACDUALT E 700/ 6 200/ 196 AC ASSOLD

% ASPHALT				4 70%	1 5.20%	5.70%	6.20%	196 AC Assorp.
ecific Gravit	У		1 2 2	2.301	2.321	2.334	2.345	0.37%
x Specific	Gravity		- 1 A T T T	2.475	2.457	2.439	2.422	RAP Information
it Weight			<u> </u>	143 6	144 8	145.6	146 4	% AC IN FAC
% Solids Total	Mix			93.0%	94 5%	95.7%	96.8%	0.5
Voids Total	Mix			7 0%	5.5%	4 3%	3.2%	% AC from RAP
oy Volume	of AC	<del></del>		9.6%	10.8%	12.0%	13.2%	0.0
% Solias of Ac	g Only			83.4%	83.7%	83.7%	83.7%	Tensile Strength
oids of Ag	g Only	*******		16.6%	16.4%	16.3%	16.4%	91.8%
oids Filled	w/Asph			57.8%	66.1%	73.6%	80.7%	% Asphalt
%Dust/AC				0.94%	0.84%	0.76%	0.70%	5.8%
EEF AC CONT	ENT			4 33%	4 83%	5.33%	5.83%	%ACIDes 1 5.B
ntial	(%Gmm)	8		84 1%	85.1%	86.1%	87.1%	Rice Gr:
-Jesign	(%Gmm)	106		93.0%	94 5%	95.7%	96.8%	Lab Gr
N maximum	(%Gmm)	169		94.2%	95.8%	97.0%	98.1%	Air Voids
signed By Sam Jahran				Comments: Citgo PG64-22 w/ 3% rub r road R50		ad R504	VMA	
Approved By	C. A.	002	spars.	QA.	to make Rando	om Co-Polymer	PG76-22	Dust/AC. 0.75

## **South Bound**

**Supplemental Test Section 370963** 

NC DOT Standard Mix with AC-20

**HDS – Surface Course** 

## NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH, NORTH CAROLINA 27611

## HOT MIX ASPHALT JCB MIX FORMULA

LEE PAVING COMPANY TYPE MIX: BCSC. TYPE HDS

SANFORD, NC JOB MIX FORM NO: 97-292-022

EFFECTIVE DATE: 11-10-97

PLANT CERTIFICATION NO: B -033 PROJECT NO:

COUNTY:

#### AGGREGATE SOURCES AND BLEND PERCENTAGES

SUPPLIER	LOCATION/SOURCE	MATERIAL	BLEND (%)	
MARTIN MARRIETTA	LEMON SPRINGS QUARRY	76-M	47-0	
MARTIN MARRIETTA	LEMON SPRINGS QUARRY	SCRGS.	33.0	
LEE PAVING COMPANY	RAMBEAUT PITT	SAND	20.0	

TOTAL 100-0%

JMF COMBINED SIEVE SIZE	GRADATION % PASSING	ASPHALT CEMENT %(TOT) 5.0
		GRADE PG64-22
2 "		EST ASH
1 1/2"		MAX - SP - GV - 2 - 454
1 "		LABORATORY SP. GV. 2.331
3/4"	100	VOIDS IN TOTAL MIX % 5.0
1/2"	98	MIN. 2 COMPACTION 95.0
3/8"	95	MIX TEMPERATURE F. 300
NG. 4	65	FLOW (0.01 IN.) 10
8	50	STABILITY (LBS.) 3000
16	3 <b>7</b>	NON STRIP ADDITIVE % 0.25
40	16	MODIFIER % 0.00
80	10	
NO. 200	5•8	

ASPHALT CEMENT SUPPLIER: CITGO WILMINGTON

TACK COAT SUPPLIER : SPECS.

NON-STRIP ADD. SUPPLIER: ARR-MAZ AD-HERE LOS-6500

MODIFIER SUPPLIER :

COMMENTS: CHANGE MADE TO THE NO. 8 SIEVE.

DATE JMF VOID:



REVISED 11/6/96

#### N.C. DOT Materials and Test Unit

Asphalt Design Laboratory Raleigh NC

370963

## REPORT ON MIX DESIGN OF ASPHALT MIXTURE North Carolina Department Of Transportation

MD# 97-292

DATE SAMPLED.				DATE APPROVED.		3-3-97	
PROJECT NO.:				ASPHALT.	Citgo Wilming	ton	AC - 20
COUNTY.				ADDITIVE.	ARR-MAZ Ad-Hen	ELOS-6500	( .25 %)
CONTRACTOR:	Lee Pavin	g Co.		Martin Manetta	Lemon Spnngs	78-M Ston	
PLANT LOC	Sanford, N	N.C.		Martin Manetta	Lemon Spnngs	Regular S	cras.
PLANT CERT. #:	B-033			Lee Paving Co.	Rambeaut	Natural Sa	_
DESIGNED BY:	John Bona	ardı					
SPECIFICATION:	HDS						
MARSHALL:	285 °F	4 inch	75 Blows				
AC SPECIFIC GRAV	TY:	1 030					

#### GRADATION OF MATERIALS USED

MATERIAL	78M	Scrgs.	Sand	-Behouse	RAP	BLEND	Spec.
PERCENT	47.0	33-32.0	20.0	10-	0.0		Range
2*	100.0	100.0	100.0	100.0		100	100
1 1/2"	100.0	100.0	100.0	100.0		100	100
1"	100.0	100.0	100.0	100.0		100	100
3/4"	100.0	100.0	100.0	100.0		100	100
1/2*	100.0	100.0	100.0	100.0		100	98-100
3/8"	94 0	100.0	100.0	100.0		97	90-100
#4	25.0	100 0	100.0	100.0		65	57-78
#8	3.0	75 0	100.0	100 0		46	38-62
#16	10	53.0	91 0	100.0		37	27-48
#40	10	28.0	30.0	100.0		16	14-35
#80	1.0	18.0	12.0	100.0	<u> </u>	10	7-15
#200	04	119	5.0	95.0		5.859	4.0-6.0
LUT LOSS		1	50			10	0.0-4 0
AGG BSG	2.616	2 632	2.625	2.700		2 624	
			7 1 1 1 1 1 1	<del></del>	EFF S G.	2.647	

#### **FORMULATIONS**

	MIX #1	MIX #2	MIX #3	MIX #4	MIX #5	% RAP / % Virgin	0/100
% ASPHALT (TOTAL)	4.5	50	5. <b>5</b>	6.0	6.5	% AC in RAP	
STABILITY-Ibs	2919	2772	3189	3576	3498	% AC from RAP	0.0
FLOW-1/100 in.	9.3	10.3	13.0	11.5	12.2	% AC Absorption	0.34
UNIT WEIGHT-lbs./cu.ft	144 6	145.5	147 4	148 8	148.5	% ASH:	***************************************
LAB SP GR (Marshall)	2.318	2.331	2.362	2.385	2.380	TSR % Retained	91.1
MAX SP GR (Rice)	2 472	2.454	2 437	2 419	2 402	Ignition Furn Calibr	
% VOIDS-TOTAL MIX (VTM)	62	50	3 1	14	0 9	% AC (Optimum)	5.0
% SOLIDS-TOTAL MIX	93 8	95.0	96.9	98 6	99.1	Rice Specific Gravity	2.454
% EFFECTIVE AC CONTENT	4 18	4 68	5 18	5 68	6 18	Lab Specific Gravity	2.331
% BY VOLUME OF AC (EFF.)	94	10 6	119	13.2	14 3	Percent Air Voids	5.0
% SOLIDS-AGGREGATE	84 4	84 4	85 0	85 4	84 8	Percent VMA	15.2
% VOIDS-AGG (VMA)	156	156	14 9	14 6	15.2	Percent VFA	70
% VOIDS FILLED W/AC (VFA)	60 3	679	79 9	90 4	94 1	Stability:	3000
COMMENTS						Flow:	10
						DUST/AC Ratio	1-28
DECICNED DV.							

DESIGNED BY

John Bonardi

APPROVAL.

% AC TOTAL:

% AC from RAP % AC ADDED.

1.2 5.0

## **South Bound**

**Supplemental Test Section 370964** 

Superpave Mix with SBS Modified PG 76-22

Surface Course - 12.5 mm

## NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH, NORTH CAROLINA 27611

#### SUPERPAVE HOT MIX ASPHALT JOB MIX FORMULA

Lee Paving Company

TYPE MIX: ACSC, TYPE SP 12.5

Sanford, NC JOB MIX FORM. NO: 98-469-021

EFFECTIVE DATE: 8/4/98

PLANT CERTIFICATION NO: B-033 PROJECT NO: N/A

COUNTY: Lee

TOTAL %

100.0

#### AGGREGATE SOURCES AND BLEND PERCENTAGES

SUPPLIER	LOCATION/SOURCE	MATERIAL	BLEND (%)
Martin Marietta	L. Springs Quarry	#67	15.0
Martin Marietta	L. Springs Quarry	#78M	55.0
Martin Marietta	L. Springs Quarry	Scrgs.	20.0
Lee Paving Co.	Rambeaut Pit	N.Sand	10.0

JMF COMBINED GRADATION		ASPHALT BINDER %	5.8
SIEVE SIZE	%PASSING		
50.0 mm	100	BINDER GRADE	PG76-22
37.5 mm	100	Gmm meas. (Rice)	2.436
25.0 mm	100	Gmb @ Ndes (Corrected)	2.388
19.0 mm	100	VTM @ Ndes (Corrected)	4 0
12.5 mm	94	VMA @ Ndes (Corrected)	16.3
9 5 mm	84	VFA @ Ndes (Corrected)	75.0
4 75 mm	43	Mix Temperature	300
2.36 mm	2 <b>8</b>	Min Compaction (% of Gmm)	92.0
1 18 mm	22	Non-Strip Additive %	0.25
0.600 mm	14	Modifier %	0.0
0.300 mm	8	Nını/Ndes/Nmax	8/106/169
0.150 mm	6	PG76-22 (ADDIT'L)	5.8
0 075 mm	4 1	% BINDER FROM RAP	0.0
		TOTAL % BINDER IN MIX	5 8

ASPHALT CEMENT SUPPLIER Koch TACK COAT SUPUPLIER Specs

NON-STRIP ADD SUPPLIER ARR-MAZ Adhere 65-00

COMMENTS

DATE JMF VOID.

APPROVED BY J. E. GRADY, JR., PE PAVEMENT CONSTRUCTION ENGINEER

=70964

P.O. BOX 37 GARNER, NC 27529

MO 98-469

				ARNER, NC 27				
TE SUBMITT	ED:	6-May-98	·		DATE APPROV	/ED:	7-31	
JECT NO.:		_			ASPHALT:		Koch PG76-2	
ı <b>≡</b> γ:		Lee			ADDITIVE:		Adhere 65-0	
ACTOR:	Le	Paving Comp	any		Martin Mariett	-	L. Springs	#67 *
INT: SIGNED BY:		Sanford			Martin Mariett	-	L. Springs	#78m
		Sam Johnson	_		Martin Mariett	a	L Springs	Screenings
CATION	:	Superpave 12.	5mm		Rambeaut		Natural	Sand
ATIONS:		8/106/169		Mix 310*F	Lee Paving		Sanford	Bagfines
SPECIFIC GR			1.037	Comp 300*F				
MARIE	TTA LAB I	NUMBER:	98A.287					
₩SSING		L. Springe	L. Sphngs	L. Springs	Natural	Santord	0	Combined
SIEVE	(mm)	#67 *	#78m	Screenings	Sand	Bagfines	0	Gradation
		15%	55%	19%	10%	1 %		160%
	50	100.0	100.0	100.0	100.0	100.0		100 0
1 1/2"	37.5	100.0	100.0	100.0	100.0	100.0		100.0
<b>≟</b> ın.	25.0	100.0	100.0	100.0	100.0	100.0		100.0
_ in.	19.0	100.0	100.0	100.0	100.0	100.0	1	100.0
172 in	12.5	62.0	99.0	100.0	100.0	100.0	1	93.8
3/8 in	9.5	30.0	90.0	100.0	100.0	100.0	ļ	84 0
. 4	4.75	5.2	23.0	99.0	100.0	100.0		43.2
- 8 - 1	2.36	1.5	2.0	83.0	99.9	100.0		28 1
#16	1.18	1.5	1.5	57 0	87.5	100.0	ļ	21.6
iO	0.600	1.0	1.5	40.0 27.0	42.0 13.9	100.0	-	13.8
!	-		<del>i                                      </del>		1	100.0	<u> </u>	8.2
<b>7700</b>	0.150	0.8	1.0	19.0	6.1	100.0	<u> </u>	5.9
<u>#2</u> 00	0.075	0.6	0.5	13.0	2.7	95.0	<u> </u>	4.1
G Bulk Dry		2.654	2.631	2.639	2.574	2.700		2.631
G Apparent		2.705	2.694	2.680	2.640	2.700		2.688
95(w		0.70	0.90	0.60	0.97	1.00		
: Conten	t:	5.05%	<b>医双流流</b>			RICE EFFECTI	VE:	2.657
		Rice Effective:			umetne at N de			
SPHALT  - Gravity				4.70%	5.20%	5.70%	6.20%	% AC Absorp
				2.287	2.318	2.333	2.346	0.38%
ecific Gr		<del></del>		2.475 142.7	2.457	2.439	2.422	RAP Information
vveignt olids Total M	Air -			92.4%	144 7 94.4%	145.6 95.7%	96.9%	% AC in RAP: 0.0
ces Total M				7 6%	5.6%	4 3%	3.1%	St. AC. from RAF
						1	+	_
olume of				9.5%	10.8%	12.0%	13.2%	0.0
olids of Agg		<del></del>		82.9%	83.6%	83.7%	83.7%	Tenade Streng
os of Agg				17.1% 55.8%	16.5%	16.4%	16.4%	84.7%
ISTAC	'INSPIT			0.94%	65.7% 0.84%	73.4%	80.8% 0.70%	% Asphalt 5.8%
AC CONTE	NT -			4.32%	4 82%	5.32%	5.82%	%ACIDes.
	%Gmm)	8		83.3%	84.7%	85.7%	86 8%	Rice Gr.
	%Gmm)	106		92.4%	94.4%	95.7%	96.9%	Lab Gr .
	%Gm/मा)	169,		93.6%	95.7%	97.0%	98.2%	Air Voids:
		7 / /			Comments:			VMA·
	V	/ / /.				/ ) <i> </i>		
ਕੁਝਾਲਾਪਲਾ_ ( ਤੁ <u>ਛ</u> ਤ	Lan	Lekian-			Block Co	· folymer		VFA.
	San		· soar	2.0	Block Co	-folymer		

## **South Bound**

**Supplemental Test Section 370965** 

Superpave Mix with PG 70-22

Surface Course – 12.5 mm

## NORTH CAROLINA DEPARTMENT OF TRANSPORTATION 370965 RALEIGH, NORTH CAROLINA 27611

#### SUPERPAVE HOT MIX ASPHALT JOB MIX FORMULA

LEE PAVING COMPNAY TYPE MIX: ACSC, TYPE SP 12.5

JOB MIX FORM NO.: 97-493-021 SANFORD, NC

EFFECTIVE DATE: 06-05-97

PLANT CERTIFICATION NO.: B-033 PROJECT NO.: 6.549001T

COUNTY: LEE-CHATHAM

#### AGGREGATE SOURCES AND BLEND PERCENTAGES

SUPPLIER MARTIN MARIETTA MARTIN MARIETTA MARTIN MARIETTA LEE PAVING CO.	LEMON SPF	MATERIAL LINGS QUARRY #67M LINGS QUARRY #78M LINGS QUARRY SCRGS. N.SAND	BLEND % 15.0 55.0 20.0 10.0
		TOTAL	100.0%
JMF COMBINED GRADA	ATION PASSING	*ASPHALT BINDER % (TOT)	5.1
2 " (50.0 mm)	100	GRADE	PG 70-22
1 1/2" (37.5 mm)		MAX SP. GR.	2.468
1 " (25.0 mm)		GYRATORY SP. GR.: Gmb@Nd	2.369
3/4" (19.0 mm)	100	VOIDS IN TOTAL MIX %	4.0
1/2" (12.5 mm)	94	VOIDS IN MIN. AGG. %	14.8
3/8" (9.5 mm)	84	VOIDS FILED W/ASPH %	72
No. 4 (4.75 mm)	43	MIN. % COMPACTION % Gmm	92.0
No. 8 (2.36 mm)	29	MIX TEMPERATURE F.	315
No. 16 (1.18 mm)	23	NON-STRIP ADDITIVE %	0.25
No. 30 (0.600 mm)	17	MODIFIER %	0.00
No. 50 (0.300 mm)	9	Nini/Ndes/Nmax	8/106/169
No. 100 (0.150 mm)	7		
No. 200 (0.075 mm)	4.4		

ASPHALT CEMENT SUPPLIER: CITGO WILMINGTON

TACK COAT SUPPLIER : SEACO, COLUMBIA, SC CRS-1 NON-STRIP ADD. SUPPLIER: ARR-MAZ AD-HERE LOF 65-00 COMMENTS: "CORRECTED COPY" Correction on MAX SP. GR.

APPROVED BY:

J. E. GRADY, JR. PAVEMENT CONSTRUCTION ENGR. D-65-1

J.E. G. 15

## MARTIN MARIETTA AGGREGATES MATERIALS LABORATORY

P.O. BOX 37 GARNER, NC 27529 270965

m097-493

SUBMIT	TED:	29-May-97	······································		DATE APPRO		6-2-9		
ECT NO.			<u> </u>		ASPHALT:		Citgo PG70-2	<del></del>	
COUNTY:	•	Lee			ADDITIVE:		Adhere 65-00		
C NTRACTOR	R. Lee	Paving Compa	anv		Martin Mariett	a	L. Springs	#67m	
.PL .NT:		ea Ridge Road	•		Martin Mariett		L. Springs	#78n:	
DESIGNED BY		Sam Johnson			Martin Mariett		L. Springs	Scmas	
S CIFICATIO		Superpave 12.	5mm	Mix 166*C					
G TRATIONS:		8/106/169	6 inch	Comp. 153*C	Rambeaut		Natural	Sand	
AC SPECIFIC	CRAVITY		1.030		Lee Paving		Sanford	Bagfines	
M RTIN MARI			97A.411		Lee Faving		Camord	Daymics	
% PASSING				l Commo	0	Natural	Sanford	Combined	
SIEVE	(mm)	L Springs #67m	L. Springs #78m	L Springs Scrngs	0	Sand	Bagfines	Gradation	
SIEVE	(11111)	15%	55%	19%	,	10%	1%	100%	
2"	50	100.0	100.0	100.0		100.0	100.0	130%	
					<u> </u>	<u> </u>			
_ 1 1/2"	37.5	100.0	100.0	100.0		100.0	100 0	100 0	
1 in.	25.0	100.0	100.0	100.0		100.0	100.0	100.0	
3/4 in.	19.0	100.0	100.0	100.0		100.0	100 0	100 0	
/2 in.	12.5	62.0	99.0	100.0		100.0	100.0	93 8	
3/8 in.	9.5	30.0	90.0	100.0		100.0	100.0	84 0	
#4	4.75	5.2	23.0	99.0		99.9	100.0	43.2	
#8	2.36	2.1	4 0	83.0		99.7	100.0	29.3	
#16	1.18	1.5	3.0	57.0		94 0	100.0	23.1	
#30	0 600	1.0	2.0	40 0		70.0	100 0	16.9	
#50	0.300	1.0	1.0	27.0		22.0	100.0	9.0	
#100	0.150	0.8	1.0	19.0		12.0	100.0	6.5	
#200	0 075	0.6	0.5	13.0		6.6	95.0	44	
Sp. Gr Bulk Dr	v	2.654	2.631	2.639	·	2.574	2.700	2 631	
S Gr Appare	•	2.705	2.694	2.680		2.640	2.700	2 558	
Absorption, %(v		0.70	0.90	0 60		0.97	1 0		
intial AC Conte		5.02%	(initial)	0.00		RICE EFFEC		ار 2 667	
millar AC Corne			•	Volu	metric at N de		1176.	200	
% ASPHALT		Rice Effective	2.664 5.02%	4 67%	5.17%	5.67%	6 17%	% AC Absorp.	
					2.364	2.372	2.375	0 54%	
Specific Gravity			2.360	2.354		<del></del>		RAP Intermetion	
M . Specific C	-ravity		2.468	2.483	2.465	2.447	2.429	4	
Unit Weight	Adis		147.3	146.9	147 5 95.9%	148 0 97 0%	148 2 97 8%	% AC - RAP	
% Solids Total % oids Total N			95.6%	94 8%	<u> </u>		2.2%	% AC from RAP	
% oids Total N	VIIX		4.4%	5 2%	4 1%	3 0%		00	
% by Volume o	1 AC		10.4%	9 4%	10.6%	11 8%	13.0%		
%_Solids of Ago	g. Only		85.3%	85.3%	85.3%	85 1%	84 8%	Tensee Strength	
% oids of Agg			14 8%	14 7%	14 8%	14 9%	15 3%	1 ,, ,	
% Voids Filled	w/Asph		70.4%	64 6%	72.3%	79 6%	85.5%	% Asphalt	
%Dust/AC			0.98%	1 08%	0.96%	0 87%	0.79%	NAC(2) - 1 - 5 /	
E AC CONT			4.52%	4 13%	4 63%	5 13%	5 63%	%AC(Des ) 5./	
	(%Gmm)	8	86.7%	85 8%	86.5%	87.2%	87 7%	Rice Gr	
	(%Gmm)	106	95.6%	94 8%	95.9%	97.0%	97.8%		
	%Gmm)	169 ;	96.9%	96.0%	97.3%	98 3%	99.1%	Air Voids	
Duligned By:	( harr	(/2 //-		D.65-2	Comments:	CAA-400(40)	•	VMA:	
	1211(	Lichan.		D ( 5	SE=46 FAA=47	CAA=100/100	J	Dust/AC Q · 96	
ved By:	V	Cipoa	$\Omega$	1.2991	Flot and Elec-	0		1003V~ V-16	
	<u>-, 7.</u>	\ LLXXX	re h.	4-6-11	Flat and Elono	10	4	<u> </u>	

## APPENDIX E

**Project Deviation Report** 

LTPP SPS Project Deviation Report Project Summary Sheet	State Code         37           Project Code         0900					
Project Classification Information						
SPS Experiment Number: 9A	State or Province: NC					
LTPP Region: 🗷 North	Atlantic 🗆 North Central 🗆 Southern 🗆 Western					
Climate Zone:	☐ Dry-No Freeze ☐ Wet-Freeze ☒ Wet-No Freeze					
Subgrade Classification:	Fine Grain   Coarse Grain   Active (SPS-8 Only)					
Project Experiment Classification Designation	n (SPS 1, 2 and 8):					
Construction Start Date: MAY 14, 1997	Construction End Date: July 12, 1997					
FHWA Incentive Funds Provided to Agency	for this Project: 🗆 Yes 🗷 No					
Devia	ation Summary					
Site Location Deviations:	viations   Minor Deviations   Significant Deviations					
Construction Deviations:	viations 🛮 Minor Deviations 🗆 Significant Deviations					
Data Collection and	i Processing Status Summary					
Inventory Data (SPS 5.6.7.9):	plete Submission 🗆 Incomplete 🗷 Data Not Available					
Materials Data:   All Scheduled San	ples Obtained and Tested 🗷 Incomplete/No Test Data					
Construction Data:   All Required 1	Data Obtained 🗷 Incomplete/Missing Data Elements					
	Required Historical Estimates Submitted (SPS 5,6,7,9) uired Estimates Not Submitted 🖾 NA					
Traffic Monitoring Equipment:	<ul> <li>☑ WIM Installed On-Site</li> <li>☐ AVC Installed On-Site</li> <li>☐ ATR Installed On-Site</li> <li>☐ No Equipment Installed</li> </ul>					
Traffic Monitoring: 🗷 Preferred 🗆 Continu	lous ☐ Minimum ☐ Below Minimum ☐ Site Related					
Traffic Monitoring Data: Monitoring	Data Submitted   No Monitoring Data Submitted					
	ction Tests Performed  Construction Tests Performed uction Tests Performed					
Profile Measurements   Preconstruction	Tests Performed Post-construction Tests Performed					
Distress Measurements:   Preconstruction	Tests Performed 🗵 Post-construction Tests Performed					
Maint. & Rehab. Data:	splete Submission 🗆 Incomplete 🔀 Data Not Available					
Friction Data:	aplete Submission 🗆 Incomplete 🗷 Data Not Available					
R	eport Status					
Materials Sampling and Test Plan:	☐ Document Prepared					
Construction Report:	☐ Document Prepared					
AWS: (SPS 1, 2, & 8)	alled   AWS Installation Report Submitted to FHWA					
Page 1 of 5 Preparer BAS	E-1 EL ABUKHATER Date 6/30/2000 NTEC / LTPP-NARO					

	PP SPS Project Deviation Report  Location Guidelines Deviations	State Code Project Code	၁	<u>3</u> :	70
	Comments Pertain to All Test Sections on Project Comments Pertain Only to Section(s): (Specify)				-
	Site Location Guideline Deviation Comments				
-	NO DEVIAT	2 NOI			
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	PP SPS Project Deviation Report Instruction Guidelines Deviations	State Code Project Code	<u>37</u> <u>090</u> 0
	Comments Pertain to All Test Sections on Project Comments Pertain Only to Section(s): (Specify)	370902 and	370903
	Construction Guidelines Deviation Comments		
-	• NC DOT selected PG 70-22 alternate superpave mix, (Section 370903).	asphalt binder	for the 58-22
-	Bulk ItMAC samples for teken at the mid-point instead of at a equal within the test sections	of each test I distance loca	were Section Tions
	The compostion of the courses of sections 37 were slightly below compaction require me	1902 and 3-	70903
	For this project, the  compaction effort at  3-10 million and a  air temperature of te  home been Nin = 8, A  NC mistakenly used N  Nmax = 169 which are used  of design ESALs but  bigh air temperature of	a design ESAL  n average des  ess than 39°C  I dos = 96, and No  ini = 8, Ndes = 106  sed for the sau  for an average	should should anx=152. and me range

Page 3 of 5 Preparer Basel Abukhater Date 6/30/2000
STANTEC/LTPP. NARO

LTPP SPS Project Deviation Report	State Code	37			
Data Collection and	Project Code	0900			
Materials Sampling and Testing Deviations					
Comments Pertain to All Test Sections on Project					
Comments Pertain Only to Section(s): (Specify)					
Data Collection & Material Sampling and Testing Deviation Comments					
Profile Index was not does not have a PI	obtained. NC	DOT			
does not have a PI	requirement no	ra_			
Profilograph.					
• • •					
No Briction data	is available +	Por			
No Briction data this project.					
F-4					

Page 4 of 5 Preparer BASEL ABUKHATER
STANTEC/LTPP-NARO

Date 6/30/2000

PP SPS Project Deviation Report her Deviations		State Code Project Code	<u>37</u> <u>0900</u>		
Comments Pertain to All Test Sections on Project  Comments Pertain Only to Section(s): (Specify)					
 Other Deviation Comments					
NO	OTHER_	DEVIATIONS			
	· ·				
		· · · · · · · · · · · · · · · · · · ·			
	<del></del>				

## APPENDIX F

Photographs



Photo 1 - North Bound - Shoulder probe with NC DOT drilling equipment



Photo 2 - North Bound - Backhoe for test pit to obtain subgrade samples and perform density testing.

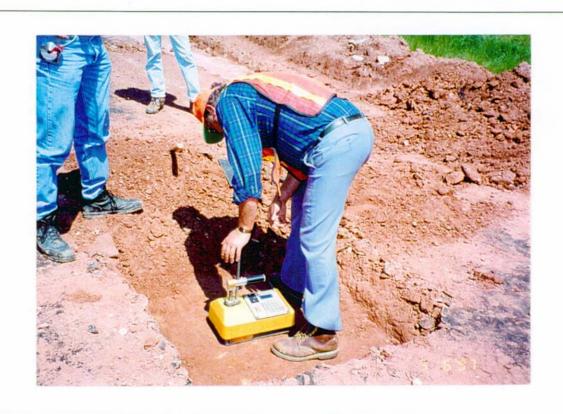


Photo 3 - North Bound - Taking nuclear gauge density measurements at test pit location

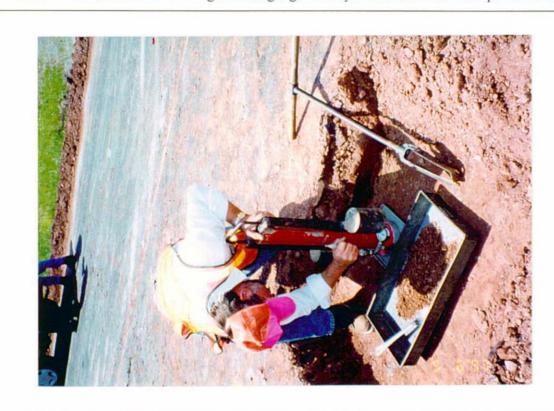


Photo 4 - North Bound - Taking conventional balloon density measurements at test pit location



Photo 5 - North Bound - Laying binder course



Photo 6 - North Bound - Laying surface course

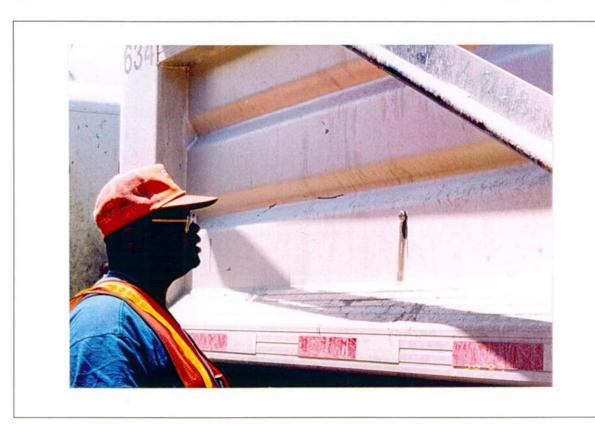


Photo 7 - NC DOT inspector measuring truck mix temperature



Photo 8 - NC DOT inspector recording truck mix temperature

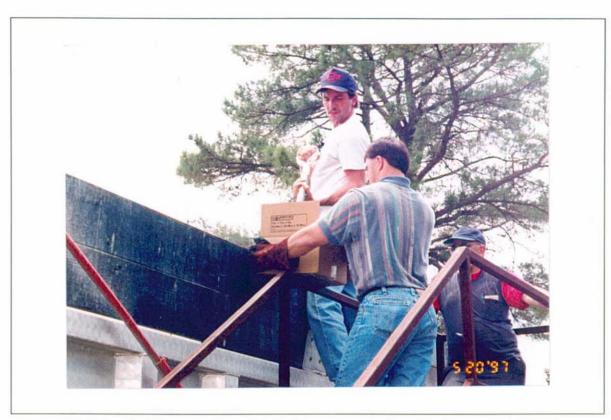


Photo 9 - Bulk sampling of asphalt concrete mix from a truck at the plant



Photo 10 - Bulk sampling of asphalt concrete base mix from the paver hopper on the roadway



Photo 11 - Bulk sampling of asphalt concrete binder mix from the paver hopper on the roadway

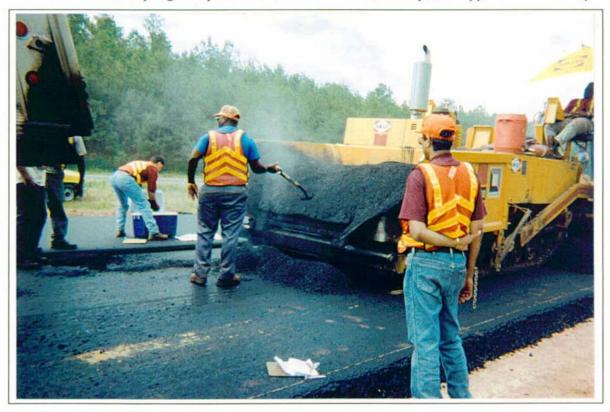


Photo 12 - Bulk sampling of asphalt concrete surface mix from the paver hopper on the roadway to the cooler box for temperature preservation for the gyratory compaction



Photo 13 – Placing the bulk samples of asphalt concrete surface mix from the paver hopper on the roadway to the cooler box for temperature preservation for the gyratory compaction



Photo 14 – Gyratory compaction of the hot mix bulk asphalt concrete samples



Photo 15 - Caterpillar Vibratory Compactor



Photo 16 - Hypac Vibratory Compactor.



Photo 17 - Breakdown, intermediate and final rollers in action



Photo 18 - Measuring air temperature during paving



Photo 19 - Tack coat applied to first lift on the south bound lanes



Photo 20 - Steam from hot mix paving at section 370964 in the south bound



Photo 21 - Checking nominal thickness behind paver on the south bound lanes

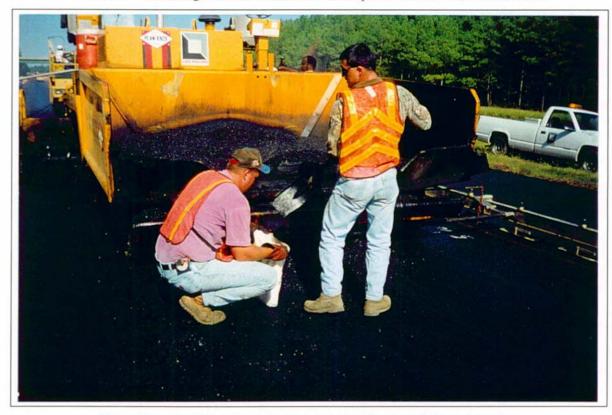


Photo 22 – Obtaining hot mix samples at mid point of the test section



Photo 23 - NC DOT staff checking density with the nuclear gauge to establish rolling pattern.



Photo 24 - Textures of the coarse 12.5 mm superpave mix and the NC DOT standard mix



Photo 25 - SBR drums with dispensing devices to the pug mill, used for section 370962 in the south bound lanes



Photo 26 - Obtaining an AC sample from the plant



Photo 27 - Lee Paving Asphalt Plant



Photo 28 - WIM with solar system and recorder at station 17+00, close to section 370965 in the south bound lanes